Vol. 42

CHEMICAL & METALLURGICAL ENGINEERING

No. 1

TWELFTH ANNUAL REVIEW AND TREND NUMBER—JANUARY, 1935

HOW THREE CHEMICAL EXECUTIVES LOOK AT 1935

SYMPOSIUM ON PRODUCER-CONSUMER RELATIONS IN CHEMICAL INDUSTRY

Price of this issue one dollar per copy.

Published monthly, price 35 cents a copy. Subscription rates—United States, Mexico, and Central and South American countries, $3.00 a year. Canada, including duty, $3.50 a year. All other countries, $5.00 a year or 20 shillings. Entered as second-class matter July 13, 1918, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Member A.B.C. Member A.B.P.

McGRAW-HILL PUBLISHING COMPANY, INC.
330 W. 42d St., New York, N. Y. Cable Address McGraw-Hill, N. Y.

Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C. James H. McGraw, Chairman of the Board; Malcolm Muir, President; James H. McGraw, Jr., Vice-President and Treasurer; L. F. Stoll, Vice-President; B. R. Putnam, Secretary.

VOLUME 42
NUMBER 1

CHEMICAL ENGINEERING

McGRAW-HILL BUILDING — 330 WEST 42d STREET, NEW YORK, N. Y.

January 15,1935.

CHEM. & MET. READERS,
Process Industries,
U.S.A.

Gentlemen:

Judging from the letters I have had from many of you in recent years, you have come to look for something in these Annual Review Numbers of Chem. & Met. other than the dead records of a past - that, lately at least, might better have been forgotten. Mere statistics aren't of much use unless you can visualize and interpret them in terms of your own problem.

So the editors of Chem. & Met. try each year to pick out from all the maze of unsolved problems, some one issue that seems particularly pertinent to chemical engineers and their work in Process Industries. Then, by arraying the available facts and focusing attention on them from many different directions, we have sometimes arrived at helpful conclusions - or at least have made a start toward a constructive solution of the problem. You will no doubt recall our approach to such problems as those arising from inter-commodity competition, from industrial inter-dependence, from the rising costs of distribution.

This year a field that seemed to us to need some further cultivation is this whole matter of producer-consumer relationships in chemical industry. As chemical engineers you occupy a unique and strategic position in this field. You are both makers and users of chemicals. You should and must know all the facts upon which your business is based. Production costs rarely tell half the story. In the words of one of your number, "It costs money to sell chemicals, to deliver them, finance inventories, trouble-shoot, hire lawyers, fight patent cases, pay high development and introduction costs, and face a tremendous amount of research expense in order to improve your process and products, just to stay in business!"

All we can hope to do in this issue is to state some of the problems and some of the facts that bear most pertinently upon them. The subject, we feel, is worthy of your careful attention, for unless we misread all the signs, your "happy and prosperous New Year" is going to, depend, more than ever before, on your willingness to face economic facts and profit from them.

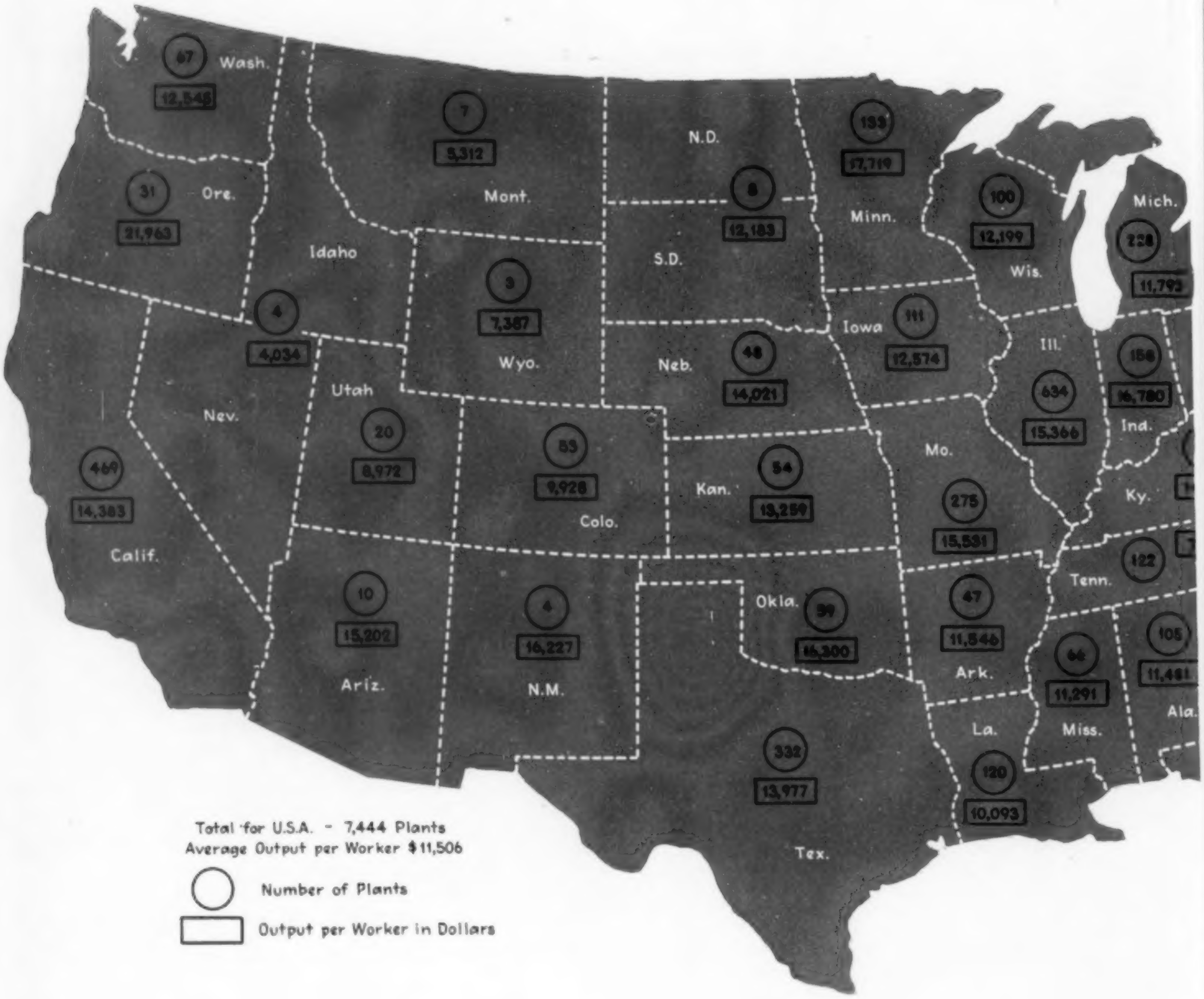
Sincerely yours,

Sidney D. Kirkpatrick

Editor.

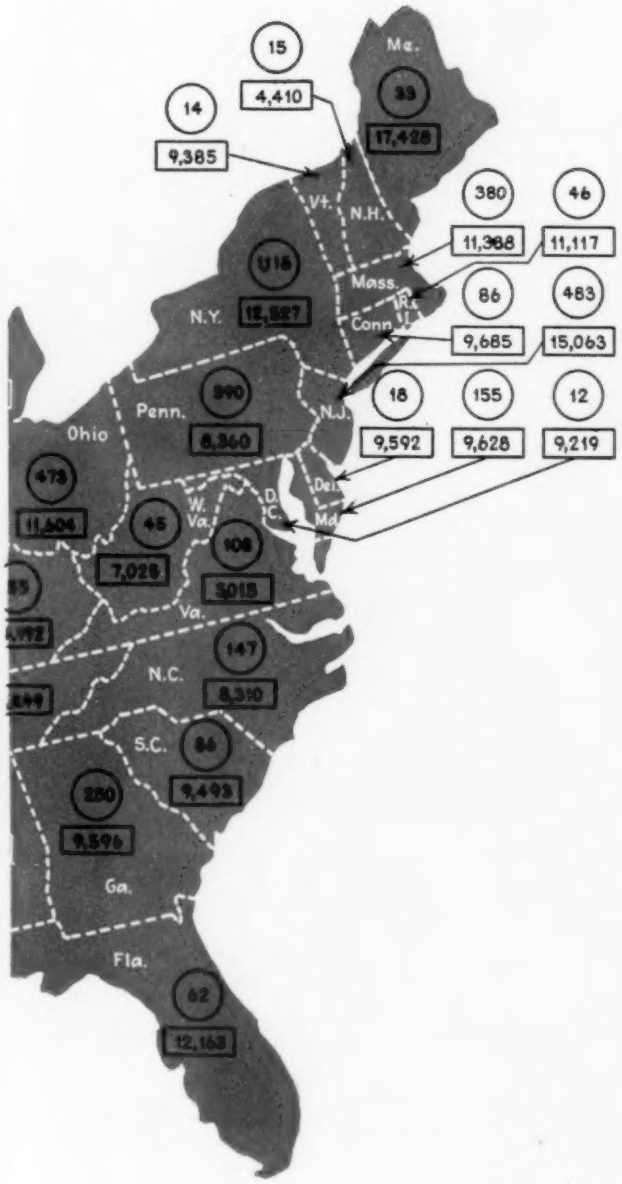
S.D.Kirkpatrick
sjm

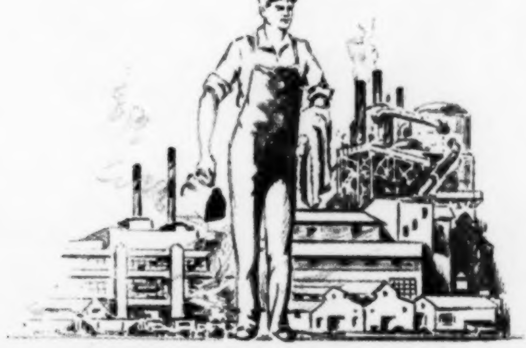
Plants and Workers in Every State Make



How does the value of the output pare with the average for your a whole ($11,506)? Remember, cal and allied industries. More will be found on later pages.

Some Chemicals and Allied Products





per worker in your plant com-
state? Or for the country as
these are averages for all chemi-
specific data for your industry

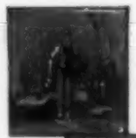
CHEMICALS AND ALLIED PRODUCTS

A hitherto unpublished summary by States of data from the U. S. Biennial Census of Manufactures for Group 6, "Chemical and Allied Products." Especially compiled for this issue of *Chem. & Met.*

Division and State	1931			1929		
	Number of establishments	Wage earners (average for the year)	Value of products	Number of establishments	Wage earners (average for the year)	Value of products
UNITED STATES	7,444	230,370	$2,650,635,023	8,224	279,198	$3,702,672,063
New England:						
Maine	33	252	4,391,801	38	350	4,542,914
New Hampshire	15	533	2,350,709	19	624	4,036,162
Vermont	14	146	1,380,301	14	173	2,120,074
Massachusetts	380	9,660	114,558,437	384	10,711	146,200,522
Rhode Island	46	1,096	12,184,622	53	1,281	14,485,698
Connecticut	86	5,559	53,838,737	91	5,926	65,006,877
Middle Atlantic:						
New York	1,118	33,014	413,573,965	1,262	41,906	596,509,505
New Jersey	483	23,858	359,382,490	498	30,761	474,369,219
Pennsylvania	590	20,928	174,968,198	635	23,033	247,679,065
East North Central:						
Ohio	473	14,364	166,586,680	547	18,037	255,926,153
Indiana	158	4,177	70,093,440	188	5,108	79,172,710
Illinois	634	16,309	250,614,633	668	19,373	343,354,054
Michigan	228	10,857	128,040,107	243	14,326	183,132,771
Wisconsin	100	2,340	28,545,859	121	3,091	45,989,716
West North Central:						
Minnesota	133	1,837	32,616,638	140	2,195	50,268,269
Iowa	111	1,277	16,057,175	134	1,410	21,715,823
Missouri	275	5,154	80,047,052	294	6,146	109,291,406
North Dakota and South Dakota[1]	8	58	706,656	13	104	860,514
Nebraska	48	347	4,865,505	56	508	7,434,937
Kansas	54	1,914	25,376,312	66	2,165	35,550,139
South Atlantic:						
Delaware	18	1,321	12,670,847	20	1,764	17,929,093
Maryland	155	7,473	71,956,428	171	9,166	92,642,185
D. C.	12	229	2,111,369	14	240	2,333,045
Virginia	108	14,378	72,106,980	113	15,642	81,281,935
West Virginia	45	4,654	32,646,029	50	5,039	44,489,715
North Carolina	147	5,044	41,918,549	165	5,021	59,555,029
South Carolina	86	2,028	19,255,567	100	2,584	26,653,728
Georgia	250	5,527	53,038,362	274	6,030	66,906,480
Florida	62	1,321	16,007,429	73	1,857	21,560,970
East South Central:						
Kentucky	55	814	11,552,792	69	1,064	19,376,102
Tennessee	122	10,774	78,111,218	144	12,891	90,668,927
Alabama	105	2,578	29,598,018	131	3,580	42,378,497
Mississippi	66	2,238	25,269,435	75	2,928	43,136,989
West South Central:						
Arkansas	47	877	10,125,633	57	1,506	25,056,210
Louisiana	120	2,449	24,729,420	130	3,727	47,742,714
Oklahoma	59	673	10,970,027	73	1,006	24,262,243
Texas	332	4,845	67,719,230	333	6,671	122,470,108
Mountain:						
Montana	7	333	1,769,165	9	218	1,913,164
Idaho & Nevada[1]	4	20	80,687	4	19	187,118
Wyoming	3	44	324,842	3	45	348,862
Colorado	53	345	3,425,392	53	374	5,386,483
New Mexico	4	50	811,375	5	73	1,141,286
Arizona	10	259	3,937,387	12	387	6,221,274
Utah	20	258	2,315,845	23	338	4,367,370
Pacific:						
Washington	67	643	8,066,659	75	837	12,048,415
Oregon	31	243	5,337,193	41	327	8,354,323
California	469	7,272	104,599,828	543	8,636	146,613,270

[1]Combined to avoid disclosing data reported by individual establishments.

HOW BIG ARE THE PLANTS



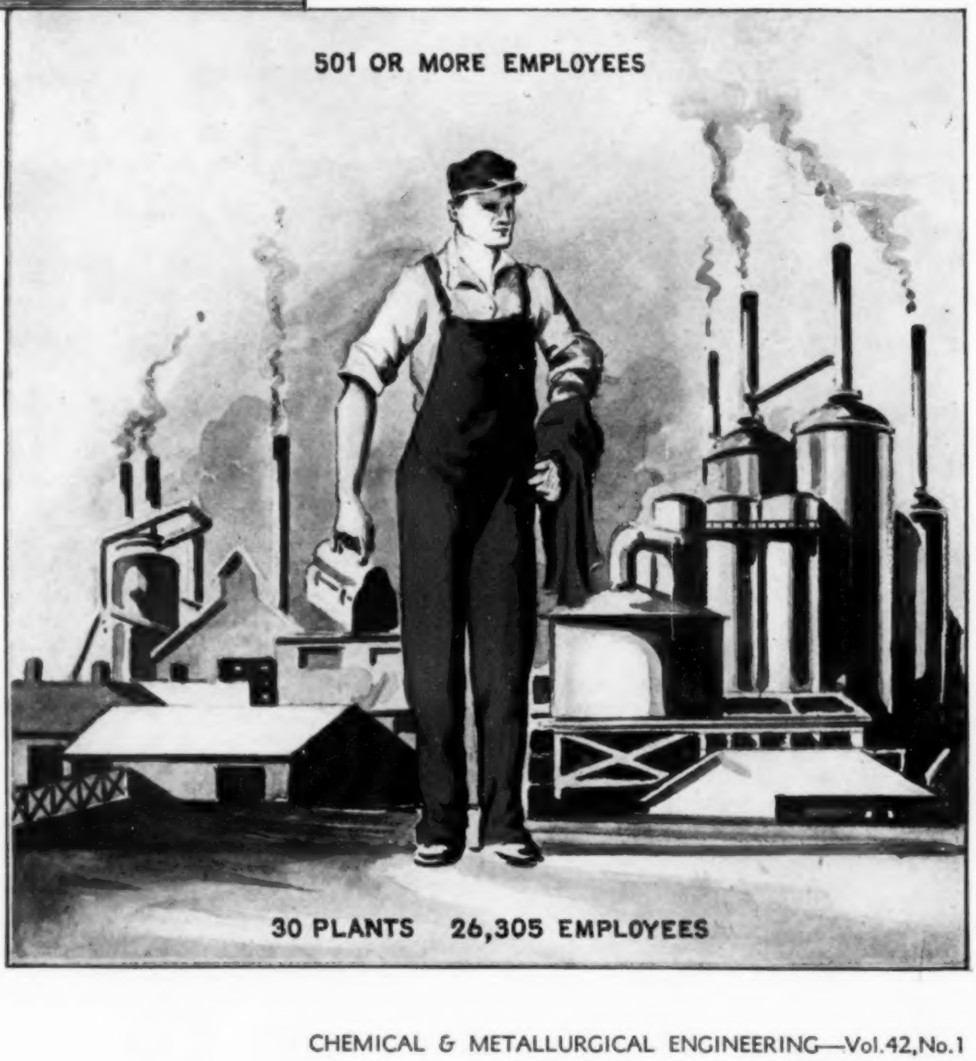
1 - 20 EMP.
233 PLANTS
1,998 EMP.

21 - 100 EMP.

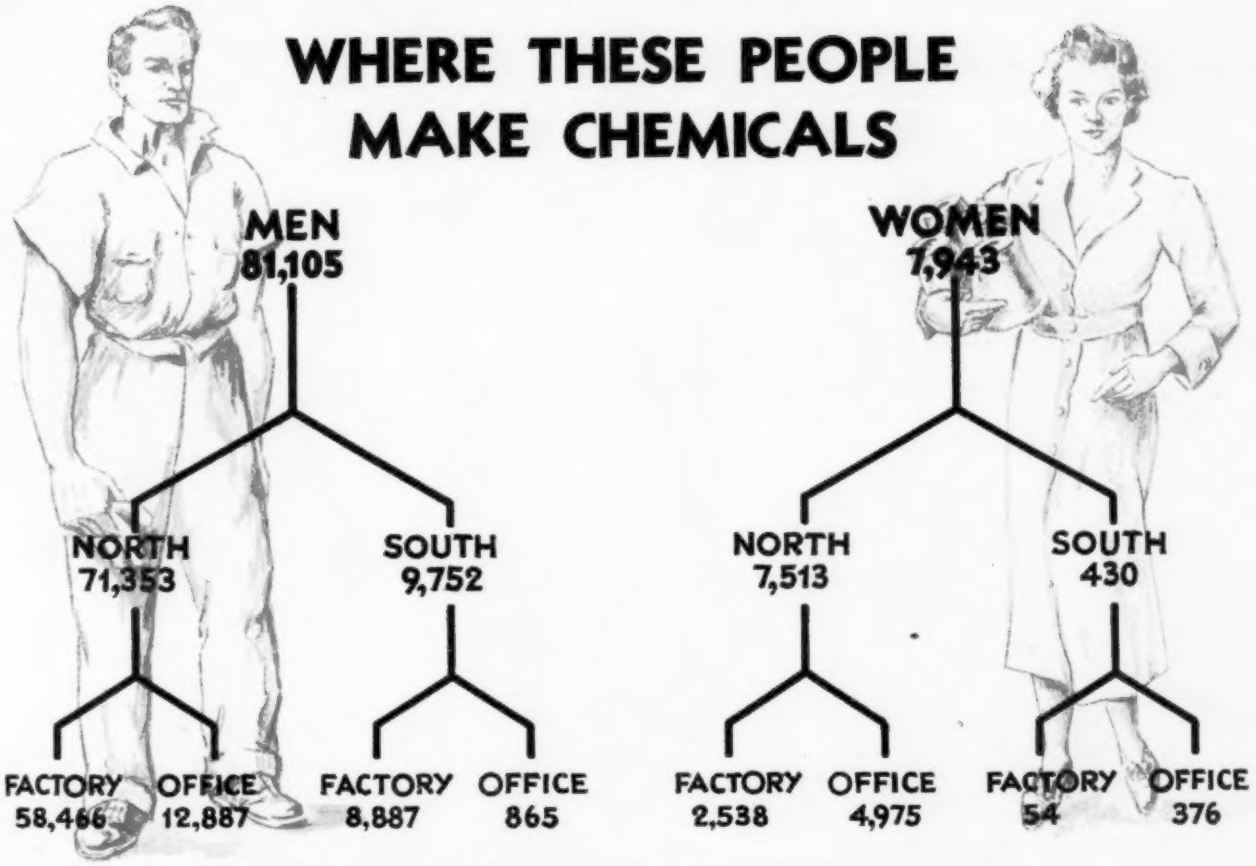
212 PLANTS
9,907 EMP.

SIZE OF UNITS	EMPLOYEES	ESTABLISHMENTS
No Employees*	0.0%	3.3%
1-5 "	0.4%	13.7%
6-20 "	2.9%	25.3%
21-50 "	7.3%	22.2%
51-100 "	9.2%	13.2%
101-250 "	19.0%	12.0%
251-500 "	17.5%	5.2%
501-1,000 "	26.1%	3.8%
1,001 or more "	17.7%	1.2%

* *Not operating*



WHERE THESE PEOPLE MAKE CHEMICALS



These interesting relationships in the chemical manufacturing industry can be shown for the first time as the result of the statistical studies of the National Industrial Conference Board, sponsored by the Chemical Alliance, Inc. The most significant figure of all, in our estimation, shows that almost 40 per cent of our chemical plants fall into the category of small establishments, having 20 employees or less. Popular belief, of course, is quite to the contrary—that all chemical units are of necessity large and completely integrated enterprises. The difficulty of applying a rigid code equitably to the small as well as the large unit is one of our problems.

MEN

NORTH

SOUTH

WOMEN

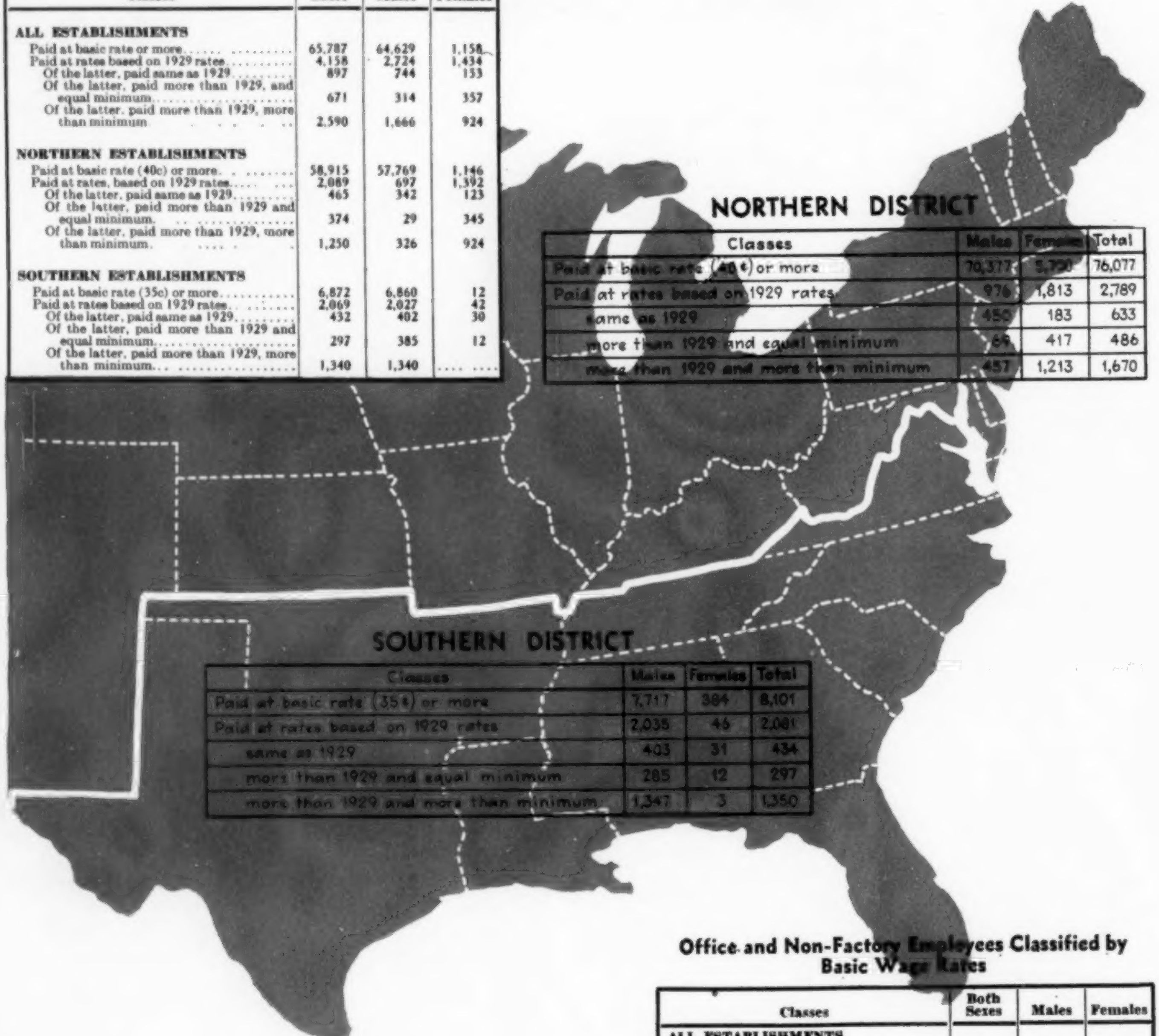
NORTH

SOUTH

WHAT ABOUT WAGE RATES?

Factory Employees Classified by Basic Wage Rates

Classes	Both Sexes	Males	Females
ALL ESTABLISHMENTS			
Paid at basic rate or more	65,787	64,629	1,158
Paid at rates based on 1929 rates	4,158	2,724	1,434
Of the latter, paid same as 1929	897	744	153
Of the latter, paid more than 1929, and equal minimum	671	314	357
Of the latter, paid more than 1929, more than minimum	2,590	1,666	924
NORTHERN ESTABLISHMENTS			
Paid at basic rate (40c) or more	58,915	57,769	1,146
Paid at rates, based on 1929 rates	2,089	697	1,392
Of the latter, paid same as 1929	465	342	123
Of the latter, paid more than 1929 and equal minimum	374	29	345
Of the latter, paid more than 1929, more than minimum	1,250	326	924
SOUTHERN ESTABLISHMENTS			
Paid at basic rate (35c) or more	6,872	6,860	12
Paid at rates based on 1929 rates	2,069	2,027	42
Of the latter, paid same as 1929	432	402	30
Of the latter, paid more than 1929 and equal minimum	297	385	12
Of the latter, paid more than 1929, more than minimum	1,340	1,340	....



NORTHERN DISTRICT

Classes	Males	Females	Total
Paid at basic rate (40¢) or more	70,377	5,700	76,077
Paid at rates based on 1929 rates	976	1,813	2,789
same as 1929	450	183	633
more than 1929 and equal minimum	69	417	486
more than 1929 and more than minimum	457	1,213	1,670

SOUTHERN DISTRICT

Classes	Males	Females	Total
Paid at basic rate (35¢) or more	7,717	384	8,101
Paid at rates based on 1929 rates	2,035	46	2,081
same as 1929	403	31	434
more than 1929 and equal minimum	285	12	297
more than 1929 and more than minimum	1,347	3	1,350

Wage rates in chemical industry are slightly higher, on the average, than those paid in industry as a whole. The National Industrial Conference Board reached the following conclusion: "Reviewing the record as a whole, the evidence is clear of a wholehearted effort to abide by the provisions of the Code, and indeed to lean over backward in so doing. The industry can justly claim that its actual practice in wage rates is more liberal to the worker than the provisions for his welfare embodied in the Code."

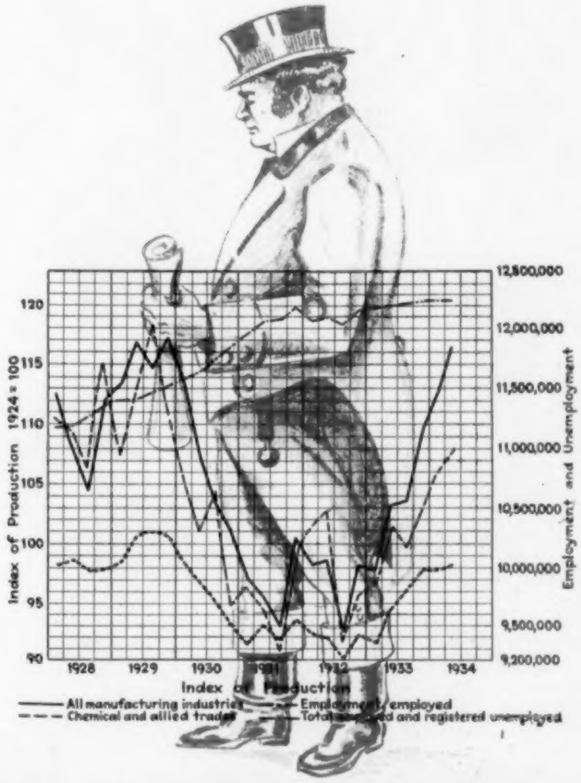
Office and Non-Factory Employees Classified by Basic Wage Rates

Classes	Both Sexes	Males	Females
ALL ESTABLISHMENTS			
Paid at basic rates or more	18,391	13,465	4,926
Paid at rates based on 1929 rates	712	287	425
Of the latter, paid same as 1929	170	109	61
Of the latter, paid more than 1929, and equal minimum	112	40	72
Of the latter, paid more than 1929, more than minimum	430	138	292
NORTHERN ESTABLISHMENTS			
Paid at basic rate (40c) or more	17,162	12,608	4,554
Paid at rates, based on 1929 rates	700	279	421
Of the latter, paid same as 1929	168	108	60
Of the latter, paid more than 1929, and equal minimum	112	40	72
Of the latter, paid more than 1929, more than minimum	420	131	289
SOUTHERN ESTABLISHMENTS			
Paid at basic rate (35c) or more	1,229	857	372
Paid at rates based on 1929 rates	12	8	4
Of the latter, paid same as 1929	2	1	1
Of the latter, paid more than 1929, and equal minimum	....	....	....
Of the latter, paid more than 1929, more than minimum	10	7	3

Recent Trends in U. S. Chemical Manufacturing Industry

TRENDS
in
PRODUCTION and EMPLOYMENT
in Chemical Industry
in the
UNITED STATES
and
GREAT BRITAIN

Recovery seems to have gotten underway a year sooner in Great Britain than in the United States. Their industries have made steady progress since the summer of 1932. Ours first shot ahead during the middle months of 1933 only to lose ground again until August, 1934. The sharp rise since then brought production up to 1929 levels before the close of the year. The British figures are taken from recent issues of their "Board of Trade Journal." Data on the Chemical Manufacturing Industry of the U. S. A. were compiled by the Research and Planning Division of the N. R. A.



British Chemical Industry Emerges from Depression

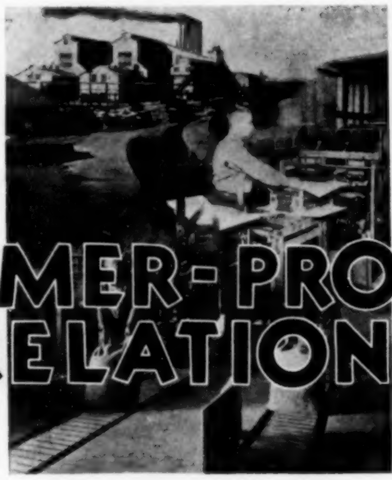
JOINT OWNERSHIP OF CHEMICAL INDUSTRY

PRINCIPAL OWNING COMPANIES

1. Air Reduction Co., Inc.
2. Allied Chemical & Dye Corp.
3. American Agricultural Chem. Co.
4. American Cyanamid Co.
5. American I. G. Chemical Corp.
6. Atlas Powder Co.
7. J. T. Baker Chemical Co.
8. Barnsdall Corp.
9. Commercial Solvents Co.
10. Corn Products Co.
11. Consolidated Chem. Industries
12. Davison Chemical Co.
13. Dow Chemical Co.
14. E. I. duPont de Nemours & Co.
15. Eastman Kodak Co.
16. Electro Bleaching Gas Co.
17. General Motors Corp.
18. Hercules Powder Co.
19. Heyden Chemical Corp.
20. International Salt Co.
21. Monsanto Chemical Co.
22. Mathieson Alkali Works, Inc.
23. Newport Industries, Inc.
24. Pennsylvania Salt Mfg. Co.
25. Pennsylvania Sugar Co.
26. Pittsburgh Plate Glass Co.
27. Stand. Whsle. Phosphate & Acid Co.
28. Standard Oil Co. of N. J.
29. Stauffer Chemical Co.
30. Tennessee Corp.
31. Union Carbide & Carbon Corp.
32. United Chemicals, Inc.
33. U. S. Industrial Alcohol Co.
34. Virginia-Carolina Chem. Corp.
35. Westvaco Chlorine Prod. Corp.
36. Wilson & Co.

Subsidiary & Affiliated Companies	Product	*Owned by
Acetol Products, Inc.	Glass substitute	14 (72)
Agfa-Ansco Corp.	Photographic materials	5 (100)
Acheson Graphite Corp.	Graphite products	31 (100)
Amal. Phosphate Co.	Fertilizer	4 (100)
American Cream Tartar	Cream of Tartar	29
American Glycerin Co.	Nitroglycerine	14 (100)
American Cyanamid & Chemical Corp.	Heavy chemicals	4 (100)
American Plastics Corp.	Casein plastics	19
American Powder Co.	Explosives	4 (100)
Armstrong-Newport Co.	Fibrous insulation	23 (50)
Atmospheric Nitrogen	Nitrates, ammonia	2 (100)
Avery Salt Co.	Salt	20 (c)
Barium Products, Ltd.	Heavy chemicals	32 (95)
Barrett Co.	Coal-tar products	2 (100)
Beaver Chemical Works	Dyes	4 (c)
Bowker Chemical Co.	Phosphates, fertilizer	3 (100)
California Chemical Corp.	Heavy chemicals	32 (c)
Calco Chemical Co.	Dyes, fine chemicals	4 (100)
Canadian Industries, Ltd.	Heavy chemicals	14 (47)
Carbide & Carbon Chemicals Corp.	Solvents	31 (100)
Celastic Co.	Treated fabrics	14 (50)
Central Chemical Co.	Heavy chemicals	36
Central Chemical Co.	Fertilizer	12 (70)
Consumers Acid Works	Acids	27
Darco Corp.	Activated carbon	6 (c)
Detroit Rock Salt Co.	Salt	20 (c)
DuPont Cellophane Co.	Transparent wrapping	14 (100)
DuPont Film Mfg. Co.	Safety film	14 (51)
DuPont Rayon Co.	Rayon	14 (100)
DuPont Viscoloid Co.	Plastics	14 (100)
Duratex Corp.	Coated fabrics	6 (100)
Eastern Alcohol Corp.	Alcohols	14
Ethyl-Dow Chemical Co.	Bromine	13, 17, 28
Ethyl Gasoline Corp.	Ethyl fluid	17, 28
Federal Phosphorus Co.	Heavy chemicals	21
Fidelity Chemical Corp.	Fertilizer	34 (c)
Franco-American Chemical Works	Heavy chemicals	25 (c)
Gardinol Corp.	Cleaning material	14 (55)
General Aniline Works	Organic chemicals	5 (c)
General Chemical Co.	Heavy chemicals	2 (100)
General Explosives Corp.	Blasting supplies	4 (100)
Grasselli Chemical Co.	Heavy chemicals	14 (100)
Heller & Merz	Dry colors	4 (c)
Independent Salt Co.	Salt	20 (c)
International Carbon Co.	Activated carbon	6 (c)
Iodow Chemical Co.	Iodine	13
Jasco, Inc.	Solvents	5, 28
Kalbfleisch Corp.	Acids	4
Kentucky Alcohol Corp.	Alcohol	33 (100)
Kinetic Chemicals, Inc.	Refrigerants	14, 17
Krebs Pigment & Color	Pigments	14 (100)
Lederle Laboratories	Biological supplies	4 (100)
Linde Air Products Co.	Compressed gases	31 (100)
Louisiana Chemical Co.	Heavy chemicals	11 (c)
Maryland Chemical Co.	Heavy chemicals	4 (100)
Merrimac Chemical Co.	Heavy chemicals	21 (100)
Monarch Chemical Co.	Baking powder	32 (97)
Monsanto Petroleum Chemicals, Inc.	Synthetic resins	21 (c)
National Ammonia Co.	Ammonia	14 (100)
National Adhesives Co.	Glue, sizes	10
Nat. Aniline & Chemical	Heavy chemicals	2 (100)
National Carbide Co.	Carbide	1 (100)
National Sulphur Co.	Sulphur	29 (100)
New England Alcohol	Alcohol	21 (55)
New England Chem. Ind.	Heavy chemicals	11 (c)
Niacet Corp.	Heavy chemicals	14, 31
Niagara Alkali Co.	Alkalis	16 (100)
Norvell Chemical Corp.	Pharmaceuticals	19 (100)
Old Hickory Chemical	Carbon bisulphide	14, 29
Owl Fumigating Corp.	Insecticides	4 (100)
Pacific Bone, Coal & Fertilizer Co.	Fertilizer, bone black	11 (c)
Pacific R. & H. Chemical	Insecticides	14 (100)
Paper Makers Chemical	Paper makers chemicals	18 (100)
Pen-Chlor, Inc.	Bleaching powder	5, 24
Peroxide Mfg. Spec. Co.	Hydrogen peroxide	32
Petroleum Chem. Corp.	Solvents	8
Phila. Quartz Co. of Calif.	Sodium Silicate	29 (50)
Phosphate Products Corp.	Phosphates	34 (100)
Prest-O-Lite Co.	Acetylene	31 (100)
Pennsylvania Alcohol	Alcohol	25
Provident Chemical Co.	Phosphates	21 (c)
Pure Carbonic Co.	Carbon dioxide	1 (33)
Resinox Corp.	Synthetic resins	9, 10
Retsof Mining Co.	Salt	20 (c)
Rezyl Corp.	Synthetic resins	4 (c)
Richards & Co., Inc.	Lacquers	6 (100)
Rossville Commercial Alcohol Corp.	Alcohol	9 (100)
Rubber Service Lab. Co.	Chemicals	21 (100)
San Francisco Sulphur	Flowers of sulphur	29 (100)
Semet Solvay Co.	Coal Products	2 (100)
Silica Gel Corp.	Silica gel	12
Solvay Process Co.	Alkalis	2 (100)
Selden Co.	Phthalic anhydride	4 (100)
Southern Agric. Chem. Co.	Super phosphates	30 (100)
Southern Alkali Corp.	Alkalis	4, 26
Southern Chemical Corp.	Heavy chemicals	4, 26
Southern Phosphate	Phosphates	12 (94)
Standard Acid Works	Acids	27 (100)
Standard Alcohol Co.	Alcohols	28, 8
Structural Gypsum Corp.	Gypsum products	4 (100)
Swann Corp.	Heavy chemicals	21 (c)
Standard I. G. Co.	Hydrogenation patents	4, 28
Tacoma Electrochem. Co.	Alkalis	24 (100)
Taylor Chemical Corp.	Carbon bisulphide	7, 24
Tennessee Copper Co.	Fertilizer, acids	30 (100)
Tennessee-Eastman Corp.	Photographic chemicals	15
Texas Chemical Co.	Heavy chemicals	11 (c)
Tobacco By-Products & Chemical Corp.	Insecticides	34 (c)
Union Acid Works, Inc.	Acids	27 (100)
United Chemical & Organic Prod. Co.	Chemicals	36 (c)
U. S. Industrial Alcohol	Alcohols	1 (22)
U. S. Phosphoric Products Corp.	Super phosphates	30 (100)
U. S. Industrial Chemical	Solvents	1 (22)
Virginia Fertilizer Corp.	Chemicals, fertilizers	21 (100)
Warner Chemical Co.	Heavy chemicals	35 (100)
A. L. Webb & Sons, Inc.	Alcohol	33 (100)
James A. Webb & Son	Alcohol	33 (100)
West Coast Kalsomine	Paint	29
Westvaco Chlorine Products Inc.	Heavy chemicals	35 (100)
Wheeler, Reynolds & Stauffer	Carbon bisulphide	29 (c)
Wilckes, Martin, Wilckes	Carbon black	21 (c)
Wood Products Co.	Wood chemicals	33 (100)
Zapon Co.	Lacquers	6 (100)

*Number outside parenthesis refers to financially interested company; number inside indicates per cent ownership. "c" indicates control



CONSUMER-PRODUCER RELATIONS

BOTH PARTIES must be pleased if one is to have a satisfactory contract between a producer and consumer. Indeed, it is just as true that it takes two satisfied persons for a good contract as it is that it takes two to make a fight. And oftentimes, the difference between satisfaction and controversy is a narrow margin of misunderstanding.

Consumer-producer relations were never more important than now. Intensive competition in a period of restricted business activity easily may aggravate minor differences and convert them into serious disputes. This is equally true whether the difference of opinion be with respect to quality or quantity of product, packaging, timing of deliveries, or prices. All these characteristics and many more are a part of clean-cut business understanding and continued happy relations between buyer and seller.

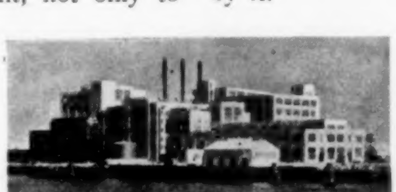
Research underlying much of chemical industry has both made and solved problems of customer relations. It is the foundation of good marketing of new commodities, but it is also the foundation of substitution and inter-commodity competition. The outstanding advantage of customer-service laboratories, enlarging existing markets, creating new uses of the sellers' products, and in trouble shooting, must be recognized. These matters are clearly presented in the articles by C. L. Burdick of du Pont and L. A. Watt of Monsanto which appear in the following pages.

Satisfactory deliveries of chemicals can often be arranged only with most complete contract understanding regarding the quality specifications, sampling and tests of deliveries, requirements as to containers, and full agreement on all other technical features of producer-consumer relations. Even the matter of scheduling deliveries is a vital consideration. Goods no matter how pure and no matter how cheaply priced cannot please if irregular deliveries necessitate excessive stocking on the part of the user. Hence questions of maintenance of stocks by producers at strategic shipping points throughout the user territory becomes important, not only to the seller but also to the buyer. Some of these questions are discussed by Editor McBride and by Lahey of American Cyanamid in their articles in this series.

The question of price is like the poor, "ever with us." But there is a growing appreciation in chemical industry that too low a price is just as bad for the purchaser as for the seller. The temporary advantage in use does not offset the inevitable subsequent hazard of interrupted supply, irresponsible companies in receivership, and the other indirect effects of chemical business run at a loss. The "right price" theory outlined in a preliminary way by Mr. Churchill is of interest in this connection.

Right now in the United States the potash industry is a conspicuous example of one compelled to operate under conditions of loss that imply serious consequences for its greatest customer industry, as well as for domestic producers. In this case the future difficulty anticipated is, of course, the potential restoration of foreign monopoly controlling United States supplies of an essential chemical. In other cases the consequence anticipated is quite different, often a subtle indirect effect. But in no case can producing industry safely be asked to operate at a loss. The customer suffers with the producer in the end.

Considering all these problems as discussed in this issue of *Chem. & Met.*, the chemical engineer and industry executive should translate troubles and achievements into the language of his own business. There is hardly an example cited in the following pages which is not susceptible of application in a dozen or score of seemingly unrelated industries. The fact that a particular author may be speaking of an individual commodity, therefore, does not limit in interest or significance the experience which he relates or the principle which he advocates. In no other field than in that of consumer-producer relations is there greater inherent analogy of importance to our readers. Let us all, therefore, study the experience of contemporary industry—and profit by it.



Does Customer Research Pay?

By C. L. BURDICK
*Assistant Chemical Director, Ammonia Department,
E. I. duPont de Nemours & Co.
Wilmington, Del.*

PROBABLY at no time in the history of the chemical industry has the need for "customer research" been more vital than during these last few years. The chemical manufacturer has had to cooperate with his client in showing him how costs could be reduced, how processes could be improved, and how a greater efficiency and economy could be attained in the use of raw materials and intermediates.

Today practically every chemical product can be substituted by or can substitute for a somewhat similar material—a condition that the economist calls intercommodity competition. Unless today a manufacturer can be in on the ground floor with his client and can work out with him the best and most efficient combination of material and technology, he will probably participate only meagerly in subsequent expansion. The consumer, once his product is established, is reluctant to make changes that, unless they greatly cheapen costs, may influence adversely the purchaser-acceptance of his commodity. This may be because of change in workability, appearance, feel, odor or any one of a wide variety of psychological factors that may produce an adverse trade reaction. Conversely a manufacturer who wishes to introduce a new material or product has a correspondingly difficult job of customer research on his hands.

Customer research is a part of an orderly procedure to accomplish the sale of a commodity. The conveying to the interested party of a knowledge of the properties and qualities of the product is the basic element of customer research. The means to this end are:

- A. Publicity
  1. direct advertising to stimulate inquiries and to obtain leads to new uses,
  2. technical articles if the development is of sufficient importance,
  3. dissemination of information by personal discussions at scientific meetings, and so forth.
- B. Sales Engineering
  1. direct contacts and consultation with the technical and manufacturing staff of the prospective client,
  2. research and engineering service to the client either in his plant or in the manufacturer's plant or laboratory,
  3. integration of activities with the sales department of the manufacturer and the purchasing department of the client.
- C. Sales Service
  1. improving efficiency of utilization of products, attending complaints on technical quality, and so forth,
  2. joint efforts of manufacturers' and clients' representatives to give technical help to the consumer to promote his satisfaction.

A complete knowledge of the properties, purity, and physical constants of a new material should be in hand before an approach to any client is made. This information, of course, is costly to obtain. Expenditures can only be justified if the facts as to properties and the facts as to potential market volume and outlets are in hand and can be properly appraised. In most cases if the properties and constants of a new product are accurately known, the usages for it are self-evident.

With effective customer research the client gains by achieving new marketable products or improved quality and lowered cost for existing products. The client can know only in general of the developments occurring in the field of his potential raw materials. The manufacturer should supply this through consumer research. Thus, there exists a community of interest through which both can benefit. The worth of the results obtained depends largely on the degree of cooperation established and the degree of confidence the customer is willing to repose in the manufacturer's technical staff.

Often it works out that the customer may have two or three competing manufacturers working independently on the same problem. This cannot be considered unfair and the manufacturer must take his chances for participation in the resulting business.

In the event of patentable discoveries resulting from customer research activities, how is the situation to be handled? Difficulties here are theoretically possible, yet it is general experience that in practice they have not occurred or are worked out on a reasonable basis. In a field where patents mean anything the customer usually has his basic position already established; or if the manufacturer has a new idea or new product which he is trying to introduce to the trade, he will have obtained whatever basic patent protection is possible before making a disclosure or approach.

Where patents are not involved, the general attitude of most customers is that a new discovery applicable in one plant may not meet the situation of a competitor at all or, even if so, a few months lead is amply adequate compensation.

A manufacturer must proportion his research effort between that of developing new products and processes and that of finding application for these developments. Nowadays the self-evident things have been done. A research that discloses a new viewpoint, a new material, or a new tool receives almost immediately the widest application. The manufacturer of a commodity does not

know from day to day how certain his future markets may be and therefore he must amortize his plant and make his profit as soon as he can. This requires search for outlets to keep the plant near capacity production.

Many outlets that originally look promising may fade. Many will demonstrate themselves too low priced to be considered as of immediate or of first order promise. It is a clever research director who picks only those that finish in the money. On the other hand, unless all the really reasonable ideas are appraised, there is a chance a competitor may make one of them into a winner.

In addition to the technology involved, major questions for economic analysis are:—where is the commodity used? how much of an outlet already exists? is the business seasonal and subject to fluctuation? is the competition already acute and will production costs be low enough? are shipping costs favorable or unfavorable? are the outlets secure and well established? are there new outlets of promise and are they a short range or long range development? what is the menace of inter-commodity competition? what is the patent situation?

The worth of research and research organizations in the last analysis has to be judged by results attained. In industrial research results sometimes are negative and as such may be valuable but not capable of appraisal. Some research projects are in the nature of insurance—for the purpose of protecting an investment—for the purpose of exploring and blocking off a field that others might preempt—in order not to be left behind in the progress of technology. In some cases appraisal of prospects or values obtainable can be reduced to an arithmetical basis. Types of situation that usually arise are:

1. Market increase achieved employing existing plant requiring no additional capital investment.
2. Markets achieved for products requiring entirely new investment from the ground up.
3. Market increase achieved requiring an investment increment for conversion of a basic product for which plant facilities already exist into a potentially marketable product.

In the first case with existing plant and a stabilized standard product, earnings on the investment are certain not to be large—in these times probably of the order of 6 per cent. and seldom at any time over 10 per cent. Chemical industry on an average turns over its capital about once in 18 to 24 months or, say, 60 per cent per year. It is certainly a maximum to spend the prospective profits of five years in developing a new field or increasing a given outlet—particularly when intercommodity competition may cut in to eliminate the manufacturer's commodity and even eliminate the final product on which the customer is placing dependence. If the manufacturer is so located or is a large enough factor that he can expect to obtain 50 per cent of the new business for himself, then on the basis of prospectively developing $100,000 of total business the manufacturer might be warranted in spending $100{,}000 \times 0.06 \times 0.60 \times 5 \times 0.5 = \$9{,}000$. On the other hand, if the project were such that it was not desirable to risk more than, say, 3 years' profits on it, the amount justifiable for customer research would be

$$100{,}000 \times 0.06 \times 0.60 \times 3 \times 0.5 = \$5{,}400.$$

If the project is an out and out "long shot," then it would probably not be worth risking more than one year's profits, then if hopes were still bright another year's profits might be risked, and so on.

In the second case representing a new enterprise requiring new capital investment from the ground up it is not usual to consider it attractive unless the money invested can be conservatively estimated to yield 15 per cent to 20 per cent. Even greater caution in the expenditure of money is indicated if it is also necessary to develop markets for the new product. For example, suppose the estimated total market for a given commodity is $100,000 of which the manufacturer anticipates obtaining 50 per cent or $50,000. Estimated earnings (on the basis of annual sales equal to 60 per cent of plant investment) would be $50{,}000 \times 0.20 \times 0.60 = \$6{,}000$ per year. With a new plant and a new product it is conservative to assume that two years will be required before market volume is reached with process running smoothly and costs down to normal. It is certainly justifiable to expect the development expense for process and product usage will be repaid from the next three years' net earnings, a total of $18,000, which might arbitrarily be split $12,000 for process development and $6,000 for product usage or customer research. If the job cannot be carried through for this expenditure the conservative counsel is to leave it alone.

One actual example on which the answer is not yet known may be worth outlining. Liquid ammonia has special solvent properties and certain attributes (volatility, etc.) that might make it useful as a reaction medium or as an extraction agent. The chemistry of liquid ammonia is almost entirely qualitative at low temperatures near its boiling point. Can a quantitative investigation of reaction characteristics at normal or elevated temperatures be justified? The ammonia manufacturer has to look at it from the point of view of increased markets for ammonia. The consumption for any given use would not be large because solvent processes today are very efficient in minimizing solvent losses. On the other hand, ample synthetic ammonia making capacity is standing idle for lack of profitable markets. On a long chance say we decide to risk 1.0 cent per lb. for the whole of five years potential sales to develop a possible 100 tons per year of ammonia outlet. This is $2,000 per year, or a total of $10,000. If, however, the market should be split 50-50 to competitors, then about $5,000 for 100 tons per year of increased outlet is all that should be risked on this research. If after spending the $5,000 the problem appears as good or more hopeful, then more funds may be justified. If, however, no more tangible leads have developed, it should be dropped.

The third case is really a combination of the first two cases and is the one of most frequent occurrence. An increment of capital expenditure has to be amortized and a transfer price for the intermediate at something better than an out-of-pocket cost has to be achievable.

It is in this field that the worth of the guiding personnel of customer research establishes itself. The measure of its excellence is inversely to the number of failures that are picked. Not only conventional research ability, but qualities of personality, cooperation, a proper combination of judgment and intuition, optimism and conservatism are essential. The above analysis discloses a further important point. An existing producer with idle capacity can afford to spend three to five times as much to develop new outlets for a product as an outsider considering going into the same manufacturing field.

PRICING

for Progress

By W. L. CHURCHILL
*Vice President, John R. Hall Corp.
New York, N. Y.*

Prices in the past have been set largely by competition, without regard to true price requirements. Recently, however, industrial engineers have determined the economic bases of prices and have discovered certain laws whereby technically accurate pricing can be accomplished. In this article and in another to appear at an early date, Mr. Churchill discusses this new science of price engineering.

CHEMICAL INDUSTRY has made impressive technical progress during the past two or three decades. Likewise, its opportunities for continued development in this direction are exceptional, provided only that it recognize the need for a price policy which will truly cover all costs, and still leave a margin for future growth, for research and the development of new products and new markets. Mere subsistence is insufficient; not only chemical industry but all industry must provide for its own continued progress. The Progress Motive, based on technological determination of "right prices," which includes the narrower Profit Motive, must replace the latter if profits are to continue, markets to expand and standards of living to increase.

Profits are in dubious repute today with a large part of the populace, being synonymous in the minds of many people with plunder. Yet strangely enough, it is hard to find two people who will give the same definition of profit. It is true that there have been exorbitant profits made in some lines and probably true that maldistribution of income has had some adverse effect, at least psychologically, on our economy. Yet from an economic standpoint it can be shown that these cases of out-of-line profits and top-heavy incomes are of relatively little importance in the whole picture. There are prices that are too high, but much more important is the great preponderance of prices that are too low. They do not provide for progress; they do not assure the continuance of the business.

It is not only the man in the street who has but a vague idea of what constitutes profit. This applies equally to most manufacturers. In a survey of 87 representative American firms, I found 35 different ideas of what constituted profit. Is it any wonder that prices fair to everyone cannot be constructed on such a divergent base? Take for instance the question of who should pay for progress. We are quite thoroughly accustomed to including in our costs the funds necessary to perpetuate the book values of our physical assets. No one would think of omitting from the fair price the sums that must take care of depreciation, depletion and amortization. Yet very few concerns see in prices the medium through which to insure perpetuation of the firm's activities. Very few appreciate the need for providing definitely for continued research and development.

Chemical industry is fortunate in being young, in having been built on research and in suffering less from tradition than older industries. Even so, I venture to say that few chemical concerns employ scientific pricing and that not many of them provide as fully for the future as need be. Not only in isolated cases but in nearly all of industry, the costs of progress come from the sacrifice of profits, rather than from the real beneficiaries of such progress—the customers. This is a broad statement, but consider the mortality of business: Statistics show that less than 4 per cent of our manufacturing industries carry on for more than 30 years without financial reorganization, spelling loss to owners and others. Even during the prosperous period of 1923 to 1929 fully 40 per cent of these industries reported deficits and many more were just making ends meet.

A simple analogy will clarify the position of the business which attempts to operate at less than the proper, scientific price for its products. A man who does not eat enough to supply his immediate energy requirements and to build up the necessary bodily reserves for future needs will surely not live long. By the same token, the business which does not secure a sufficient income to enable it to perpetuate itself and to make at least a normal degree of progress is also doomed to eventual death and to be a social liability as long as it survives.

There are two distinct business philosophies in regard to prices. One group of business executives subscribes to the idea that prices are strange, unaccountable things, determined by the mysterious workings of competition

and bearing no particular relation to costs. Business juggling resulting from this view is largely responsible for the development of the fine art of price-cutting and "chiseling." Another, and growing, group, however, sees no justification in selling any product or service at less than the fully profitable price. This latter group has found that a progressive attitude, a willingness to abandon lines that are definitely unprofitable and an understanding of the necessity for adequate selling effort, coupled with prices that include all necessary elements, contain the solution to the problem of progress. Later discussion will show which of these groups is more desirable economically in the industrial community.

The question of scientific price determination is not one of settling on any particular item of price and deciding it is too low or too high. Rather, it demands the proper balancing of all the elements of price, to the end that the price shall be fair to everyone, owners, employees and consumers alike. Price may, and often does, contain too little inducement to capital. Rarely does it contain sufficient that is definitely earmarked for future growth, for the contingencies of bad years, for development and experiment. And in less than 10 per cent of American business enterprises, studies have indicated (Churchill, W. L., "Pricing for Profit," p. 78, The Macmillan Co., 1932), is sufficient spent for selling effort, even in times of good business. Many of these enterprises spend less than half the amounts they should so spend, and a surprisingly large number spend less than a quarter of what they should be spending on sales effort. It has, in fact, been estimated (*ibid.*, Chap. IV) that manufacturers in the United States should have spent $5 billion more in 1928 and 1929 for sales effort alone than was actually spent, and that they should have collected $7½ billion more in profits. That they failed adequately to profit is chargeable largely to the fact that their selling efforts were insufficient. Through this additional expenditure for sales they could have employed at least 2 million additional people, while the additional profits would have employed many more.

These are surprising charges which business men who do not think in engineering terms will be certain to resist. The philosophy of pricing which permits an industry's income to approach the level which will force it out of business has also fathered the belief that distribution costs must be reduced and that all expenses must be pared to the bone. This is the school of business which strives for profit through saving, rather than through business building, the school which tends to perpetuate the sort of vicious spiral of business that has so prolonged the present depression. Its followers, while they recognize, perhaps, that employees are customers, fail to appreciate that there is anything they can do about it. For every employee discharged, through the long cycle of trade they eventually lose a customer whose loss must later mean another discharge, and then another.

It should not be difficult to convince chemical engineers, however, that there is an engineering approach to the problem. Just as engineers, over the heads of business men, so revolutionized production in the space of a few decades that since 1923, for the first time in history, our capacity to produce has outstripped our ability to consume, so engineers have evolved the solution to the price problem. Principles that have been brought out by the new science of price engineering are capable of showing in every case what the true economic price of a product must be. So certain are these principles that it is safe to state that no single industry can continue to prosper unless it apply them. Industry in general cannot continue to thrive without its coming to an understanding of "economic right price."

There is one field of activity that has already discovered the principles of right pricing and has for years applied them, with the result that it is today the country's most stable industry. Were it not for the fact that the insurance industry must place its money at interest with other industries which have not applied right-pricing principles, nothing would be more certain than its ability to continue and progress. The secret of its success, if I may be forgiven the term, lies in the application of "norms" based on the mathematical interpretation of experience. No one would think of trying to beat down insurance premiums, for it is obvious they are based on what the company *must* get to be able to discharge its obligations, and to provide for its perpetuation. Price cutting and "chiseling" are unthinkable in the case of insurance; why any less so in other industries?

A word to explain the use of norms is necessary. A particular operation or process is capable of accomplishing a desired result. To accomplish this result it will need a measurable amount of expense for shelter, supervision, light, heat, depreciation, taxes, insurance, etc.

The same process, using the same equipment and facilities in another plant or any number of other plants, would have the same normal cost of operation per hour, week or year. The efficiency with which different plants might conduct their operations does not affect the normal cost. That would affect the earnings, as the more efficient plant would earn more than the less efficient. The norm changes only when the cost ingredients are changed, as when a different process is substituted. Customers are neither penalized nor favored by the vagaries of operation. These penalties or benefits are placed upon the owners—where they belong.

Knowing only what processes are employed, then, and totally without regard to the efficiency of the human element, engineers can determine what cost should actually be assigned to any operation. But this does not mean price-fixing, nor even uniform prices from maker to maker, for *process efficiency* will vary, raw material costs will differ and other elements will change from manufacturer to manufacturer. It is true that under an economic system of pricing all prices will eventually tend toward that of the most efficient producer, but the stifling and uneconomic effects of price fixing will not have been resorted to. At the same time, all elements of cost will have been included and industries will have provided for future development and *future markets*.

Just as the true, economic costs of operation can be determined by engineering methods, so can the necessary elements of cost having to do with the progress of the industry be calculated, as well as the necessary return to ownership and to capital and the amounts that must be expended in promoting the sales of the product. Economic laws have been uncovered which show with the greatest of certainty what sales effort must be made. And a combination of these various certainties can be made which will result in deficitless operation for any industry, almost to the point of vanished business.

Technical Servicing for Chemical Products

By L. A. WATT
Monsanto Chemical Co.
St. Louis, Mo.

Not many years ago the technical service man, or "trouble shooter," as an adjunct to chemical sales, was non-existent. Increasing complexity of the sales problem, however, has now made an important place for this specialist. What he is and does, how he comports himself, are covered in this article.

IN THE early days of most industries, a manufacturer is concerned mainly with producing goods for which uses are already established, thereby reducing trade to the simple terms of supplying the demand for staple products. But as an industry grows and becomes well established, the aim is to supplement staple items by creating new products and new uses for old ones. The marketing problem then becomes more and more complex and technical service enters into the picture as a necessary part of selling.

For instance, there was nothing particularly novel about the iron and steel industry as long as its products were confined mainly to stove castings and standard railroad equipment. But when alloys and special steels were introduced, their worth had to be proved to potential users before orders were forthcoming. The new industry had to *demonstrate* the value of its new products and sell the trade.

A technical service man, therefore, is a demonstrator, a liaison officer between research-production and the ultimate consumer, both the forerunner and the supporter of the salesman.

In the chemical industry, as long as we made sulphuric acid and combined intermediates from abroad according to set formulas, there was no need for technical service. The men who bought chemicals knew as much about them and often more about their uses than the men who sold them.

Now, however, with the development of the chemical industry along broader lines, we have ceased to be imitators and have become creators. It is necessary to maintain staffs of specialists who are familiar with buyers' products, if not with their processes. At the minimum, these specialists or technical service men must know the quality that the buyer maintains in his finished product and the purpose which it serves.

There has been a shift in recent years in the attitude of the producer toward the consumer. In some cases it is carried to apparently unnecessary extremes. Witness to this change is the large number of offers made to assist consumers in the use of products. This holds true with everyday commodities from bread to automobiles, as well as with specialized products such as chemicals. Advertisements in all kinds of mediums, technical and popular, place increasing stress on how to use the advertised product. It is no longer sufficient to detail the merits of the product. Millions are spent every year in the effort to tell consumers how to obtain greater value from products by using them properly, or by setting forth new uses for them. Thus are expanded markets created.

Technical service is tied in closely with research, application work and sales. It is not sufficient to make a product and announce its availability to secure orders. The product must be thoroughly tested by the company that makes it as to its usefulness within the industry for which it is intended, because the trade looks more and more to the producer, not only as to the product but also how to use it.

It is not advisable, usually, to try to cover the intimate or specific application of the product but the producer must supply physical and chemical data, compatibilities, typical formulas, and so on, and should try to cover the product's applicability to a certain field. The obvious uses of the product will take care of themselves without the aid of technical service.

There has been, and still is, a crying need for materials which will resist the corrosiveness of hydrochloric acid under any and all conditions. If and when such a material is made available, its resistance to various concentrations of the acid will be established. It will then be the duty of the technical service division to work with prospective users of the material to show them that the handling of hydrochloric acid of certain concentrations

and at certain temperatures under practical conditions has been solved.

Aspirin is a good example of the changing of a product to meet changed conditions. First of all, there was a need for a form of aspirin which could be tabletted directly and economically. This need was first fulfilled through the introduction of a new type of crystal which, mixed with starch, could be compressed without previous granulation. This advance was followed by the production of a granulation of aspirin containing starch. It was found later that the majority of tablet manufacturers were adding more starch before compressing in order to facilitate disintegration (often mistaken for dissolving). It was the logical procedure to work out the optimum amount of starch which would give the desired results and have the original granulation contain this amount so that no addition of starch would be necessary by the purchaser. This is a simple case but illustrates the value a technical service organization can render through familiarity with the problems of the users of a product and the manufacturer's ability to solve it.

In technical service work, the manner in which the representative conducts himself in his contacts with customers, or potential customers, is of vital importance. In the first place, it is useless to go into the trade without knowing one's own product and the principles of its application by the company or individual who may use it. When a technical service man makes this error, personal embarrassment may be alleviated in time but the main point is that he would not be serving his house effectively. Training and experience are important factors.

The producer's representative should so conduct himself as to inspire confidence, but above everything he should not assume the attitude of "knowing it all." Such an attitude engenders antagonisms, which not infrequently become deep-seated and permanent with consequent loss of the producer's time and money and his chance of making a sale. It is surprising how often a simple suggestion is cordially received.

It is well to feel one's way along, particularly if one is not familiar with the organization. There are oftentimes practical questions as to rank and other organization matters against which the technical service man may run afoul. The situation in any case can be handled diplomatically. It is, of course, essential for the technical service man to see to it that he is welcome to return. Succeeding visits are the ones that often prove the most profitable.

The help which the technical service man renders may depend upon his obtaining confidential information from the organization he is contacting. There naturally is a hesitancy in disclosing such information. The producer's representative can build up confidence by rigid observance of the trust placed in him. It may take time. It is helpful to explain to the buyer that confidential information is necessary to the solution of the problem. It is obvious that information, received in confidence, must be held in confidence and not peddled. The value of a technical service man to his own organization is immediately and totally lost if he breaks a confidence in order to further additional sales.

Assuming the technical service man has the degree of integrity that a position of trust presupposes, there are other qualifications which he should have. His personality should be agreeable, if not striking. He is frequently the first representative of his company to visit a prospective customer and much depends upon the impression he creates. He paves the way for the regular salesman and establishes his company with the client.

The technical service man must have a good basic training in chemistry or chemical engineering. With his technical skill there should be combined a large measure of common sense. Vision and imagination he must have, but they are of small value unless he also has the ability to evaluate practicalities. He should have sufficient experience in laboratory and plant to enable him to talk intelligently with those to whom he has been appointed to render assistance. He must have a sense of economics. If he has no actual sales experience, he must at least have sales sense in order that his work may be synchronized with the sales department.

Maintenance of a technical service division is a considerable item of expense. It does not enter into manufacturing costs, but rather distribution, therefore, sales costs. The best way to minimize the cost of technical service is through the competent and intelligent application of research and the dissemination of information by bulletins and other mediums. By making technical information available to the trade, the amount of personal contacting can be reduced with a resulting lower cost.

Some of the most successful chemical manufacturers use very little general advertising copy which usually is described as institutional. The bulk of their advertising is made specific, based on fundamentals and application research. Such advertising copy includes information concerning the physical properties of their products and suggested uses, many of which are original. This fits in with technical service and in effect constitutes technical service because it imparts technical information to prospective users.

When technical service involves the designing of equipment, assisting or even doing all the work, a charge is justifiable. Monsanto's vanadium catalyst used in the manufacture of sulphuric acid is an example. Not only is the catalyst supplied but also the necessary engineering and complete working drawings. The purchaser essentially is furnished with expert information at cost.

In conclusion, one major aim of a technical service division should be to keep the existing trade satisfied by contributing thoughts and suggestions for improvements from time to time. All of this was summarized by one of our largest chemical manufacturers to whom is attributed the statement, "One never loses by making a better product." Another aim should be to maintain familiarity with the chemical trade and users of chemical products.

Knowledge gained in this manner should enable the technical service division of a company to make worthwhile suggestions for the improvement or modification of old products and ideas for new ones. In a wide-awake chemical company today this thought does not stop with the technical service division, *per se*, but serves as a stimulant for the entire organization, whereupon research and manufacturing departments and even executives become so prolific with suggestions that the mere culling of them is a job in itself.

CONTAINERS

that Serve Customers

By R. W. LAHEY
American Cyanamid Co.,
New York, N. Y.

A great many containers now in use in the chemical industry have been handed down from the days when the industry was struggling for its existence and therefore seem to be children of necessity rather than the result of a careful study of the customer's needs. By the redesign of the container it is often possible to improve upon its convenience and to make a saving to both producer and consumer

THE USE OF packages that best serve customers is a subject that has taken on importance second only to the quality of the products they contain. A product should be packed in a container which lends assistance to customers and creates good-will with their storekeepers, foremen, superintendents, and factory managers —in short it should be a friendly package. A product packed in a container that is hard or disagreeable to handle, that is difficult to store, that is not easily opened, and from which the product is not easily removed is continually in danger of losing its place in the customer's raw material program.

A great many containers now in use in the chemical industry have apparently been handed down from the days when the industry was struggling for its existence and therefore seem to be the children of necessity rather than the result of a careful study of the customer's needs. Some manufacturers believe that it is an error to change an established package even though such changes will result in economies to both the manufacturer and his customer. Changes which benefit the customer should be made at any time without fear of loss of business as has been proved time after time by the experience of many companies. It is refreshing to note that some chemical companies are beginning to realize that often their customers can make considerable savings in their operating cost if they are supplied with containers which are adapted to their needs.

A comparison of the containers in use in the food products industry with those in use for packing chemicals clearly shows how the chemical industry has lagged. The improvement in the food industry can be traced to the fact that the requirements and demands of consumers have played an important part in the choice of packages. The change in cheese-spread containers from glass bottles, fiber boxes, or tin foil wrappers, to small drinking glasses was not only a clever advertising or merchandising stunt, but it was also based on the sound principle of providing the customer with a re-use package. Incidentally its use in the household is a constant reminder of the product. The cost of a container which is discarded by the consumer is an economic waste, and the cheese industry has been smart enough to eliminate this waste. You are correct in thinking that packaging cheese in small drinking glasses has no connection with bulk or large chemical packages, nevertheless the idea of supplying customers with containers which can be re-used is one that should have more recognition in the chemical industry.

Perhaps a more apt example is the recent change by the manufacturers of shortening from tight wooden barrels to single trip 18 gage full removal head 55-gal. drums. These packages go largely to the baking trade. Here is a case where bakers keep a barrel in their bakery and from time to time scoop out small amounts of shortening. They have had to contend with leakage, contamination from wood splinters, and the difficulty of covering the partly used barrel. To correct this situation a drum manufacturer has applied a lining on which the shortening has no effect to the steel drum. As a result he has been able to interest the consumers in specifying this type of container because it is leak proof and provides freedom from contamination; furthermore the full open head can be removed easily and when replaced makes an effective seal.

These are two illustrations of instances where manufacturers have chosen containers for their products which are ideally suited to their customers' requirements. In the first instance a container which has a re-use value has been used, and in the second case a container which has several definite disadvantages was replaced with one which met all requirements of the user of the product. In considering the customer's point of view it is necessary to study his storage and handling conditions, his methods of using the product, and the possibility of supplying him with a package that contains the exact quantity of material which is most economical or convenient for him to use. Consideration must also be given to the suitability of the container for repacking or general use around the plant. This is entirely apart from the sal-

vage value which accrues to most packages. If containers cannot be re-used or have little or no salvage value they should be of such a type that they can be disposed of inexpensively. These considerations should be given as much importance as the other well-known requirements which every container must meet.

Returnable containers have been used in the chemical trade because safe transportation of many dangerous products has required packages which are too expensive to limit the usefulness to a single trip, and this practice has been unnecessarily extended to many products that are not dangerous. Container research has helped the alcohol industry in the development of the 18 gage 55 gal. I.C.C. 5 E drums which have replaced the returnable heavy drums for alcohol shipments. And more work of this type will surely bring to light single trip containers which can be used for other materials. Returnable containers are a constant source of trouble to tranquil customer relations due to the well-known controversies which arise over responsibility for damaged packages. Therefore the question of return of deposit becomes of great importance to future business. This factor in addition to intangible costs of accounting, billing, and so forth, which are hard to estimate, together with the battered appearance of some returnable containers, makes it highly desirable to adopt a single trip container wherever it is possible.

It is well known that the Interstate Commerce Commission has set down specifications for containers and regulations for the transportation by rail of explosives and other dangerous articles, and that they have recently published regulations extending these specifications to shipments by water and by motor trucks engaged in interstate transportation. These regulations become effective Feb. 1, 1935, for the former and March 1, 1935, for the latter; and therefore unless dangerous articles are transported in company owned trucks and boats or by carriers not engaged in interstate transportation, they must be packed in containers specified by the regulations. Customers who purchase dangerous materials must develop a sense of confidence in those suppliers who pack their products in containers which meet the existing government regulations. In addition to using packages specified by the Interstate Commerce Commission, it is important for the manufacturer to maintain thorough and constant inspection of these returnable containers, as an accident in a customer's plant which is caused by a defective container is liable to result in loss of confidence.

Education of the customers' employees in the handling of containers of dangerous articles is time and money well spent. The chemical industry through the Manufacturing Chemists' Association container committees are preparing instructions for safe handling of corrosive and dangerous materials, and some of these data have been passed on to customers by various manufacturers. This work creates an attitude of confidence in the minds of customers.

The container and packaging industries are now in a period of intense research and development, and all chemical manufacturers should be familiar with the details of this work and with the new types of packages which this research has developed. A few of the more important trends are as follows:

1. Some manufacturers of heavy duty paper bags have placed on the market automatic packing, weighing, and bag closing machinery which can handle a wide variety of powdered and pelleted materials. Along with this new machinery they have developed bags which are more water vapor resistant than heretofore and which are free from dusting and contamination.

2. Some burlap bag manufacturers are successfully making pasted seam paper-lined burlap bags and have machinery which will produce pasted closures for these bags. The manufacturers have increased resistance to liner tearing by increasing the percentage of creping in the paper liners and substituting rubber latex for asphalt as an adhesive. Resistance to moisture has also been improved.

3. Some loose creped paper bag and barrel liners are now made which stretch in all directions thereby increasing tear resistance. Also the moisture resistance of these products has been improved.

4. Remarkable strides have been made in the construction of fiber drums. Some are able to withstand rough handling, have a very good moisture resistance, and are extremely well adapted to prevent contamination.

5. Some light weight steel drum manufacturers are improving closures, seams, painting and embossing. And they are developing drum linings which will allow the use of these packages for products which react with sheet steel.

6. Some heavy or returnable steel drum manufacturers are working independently and with the drum committee of the Manufacturing Chemists' Association to improve the sheet steel, spuds and plugs, rolling hoops, and welding of their products.

7. Rubber companies are actively engaged in increasing the use of rubber in containers and considerable progress has been made.

8. Some manufacturers of veneer wood drums are improving these packages by strengthening and lining them.

A study of your customers' container requirements combined with a knowledge of current container developments will certainly result in an important improvement, which will not only be gratifying to the customers but may result in worthwhile savings to the manufacturer who is willing to spend the time and effort to investigate the problem.

Space does not allow a more detailed discussion of this important but often neglected part of a manufacturing business, but there are several other package considerations which are just as important as the question of containers that serve the customer. In closing, however, I would like to digress for just a moment to point out to the manufacturer the importance of providing proper supervision of the container problem. The chemical industry's bill for containers amounts to the astounding annual total of many millions of dollars, but for some unknown reason only a relatively small percentage of its members have provided for proper supervision of this expenditure. The responsibility for packages is usually handled by the production department whose main job is production and quality of the product, and therefore container problems must necessarily and correctly be regarded as a secondary consideration. The sales and purchasing departments also have a hand in the container problem, but these departments have even less responsibility than the production department, thus it hardly seems necessary to point out the need for sole responsibility and specialized ability to handle such large expenditures. Generally, more efficient control is exercised over relatively much smaller expenditures.

Specifications

In Chemical Marketing

By R. S. McBRIDE
Editorial Representative
Chem. & Met.

Trade names and catch phrases are doubtless useful in merchandising commodities for household consumption. Process industries, however, need more than this. They require a clear definition of the quality of goods bought and sold and a sound method for policing deliveries. On no other basis can chemical merchandising be permanently satisfactory.

BUSINESS arrangements, to be satisfactory, require a definite understanding between buyer and seller. In technical merchandising, such as the selling of chemicals, clear delineation of the character and the quality of product to be supplied is, of course, essential. Specifications for chemicals, therefore, are a necessary part of many contracts.

The type of specification required in any chemical transaction depends largely on the nature of the goods, but also somewhat on the type of purchaser. If the buyer be as well informed on technical matters as the producer-seller, there can be a wide range of specifications, and the need varies with the degree of acquaintanceship existing between the two parties to the transaction. Many contracts between responsible firms might just as well say merely "more, like last year's supply." In fact, in many cases great elaboration of specifications, with complicated tests, may reach the point of adding only burdensome and meaningless detail. Costs go up and satisfaction declines.

In many types of chemical transactions only the producer group is intimately acquainted with chemical detail. In such transactions the purchaser, though technically informed about his business, is not, and does not wish to become, a chemical enterprise *per se*. And yet specifications are here also very important. But the specification usually is one widely recognized, used as a basis of reference in an agreement, and not requoted or requiring detailed application in every transaction.

Let us take a storage battery sulphuric acid problem as an example of this latter type of transaction. In this case it is becoming well established by scientific work what grade acid is necessary for satisfactory battery performance. A standard specification is even now in the making, which is likely to become almost universal for this type of business. (See *Chem. & Met.*, Dec., 1934, page 667.) Manufacturers of acid will gladly agree to meet such a specification.

There are relatively few chemicals which go to the general public or to non-technical industry. Hence there are relatively few specifications like that now being formulated for sulphuric acid which have some use on the part of non-chemical enterprises. Slowly, however, this situation is changing. There is an increasing demand that more and more goods be made to specification and labeled as to grade. We may call this a Left Wing trend if we will, but it is very real. And it is likely to continue. Chemical industry must accept this situation; even though there seems to be no serious public demand for specifications for certain commodities, it will be the part of discretion to formulate them and secure their general acceptance, thus forestalling public clamor critical of the goods.

Participation of Government in specification drafting is important in many cases. Often the Federal Government is substantially the only agency which will be regarded as an acceptable representative of many small purchasers. Industry can well, therefore, look to Federal specialists for aid, especially if research as to test methods or controversy over desirable requirements is expected. Within the industrial field the reconciliation of purchaser and consumer interests is often aided by the work of American Society for Testing Materials. And the procedure of American Standards Association, which ultimately leads in any field to an American Standard, is also an important part of the specification work of certain divisions of chemical industry.

Sometimes the drafting of sound specifications is too long delayed. Makers of galvanized iron can testify with keen regret that this may be the case. For many years they sold their product on the theory that the trade name of the producer was a sufficient guarantee of quality. As competition got more keen coatings got less satisfactory, often wholly ineffective. The whole zinc industry was threatened with serious loss of business if something could not be done about this. The zinc industry indeed found itself fighting a serious rear-guard defensive action.

When this situation became evident, the first move was to suggest that the thickness of the zinc coating be used as the determining characteristic of the specification. Well informed purchasers objected that mere weight or thickness of coating was not enough to ensure continuity or quality performance. Less competent purchasers took an even more critical view, implying that this was a fine scheme to increase the consumption of zinc, and the price of galvanized plate, but that it was not helpful to them as users. Only when a sound program of complete cooperation under a sectional committee of A.S.A. had been adopted was there thoroughly satisfying progress towards mutually acceptable specifications.

This experience, which might just as well have been in the field of any one of a dozen chemicals, well illustrates also the fact that cannot be too strongly stressed—if producers do not draw specifications, customers will.

In some fields of chemical-engineering industry specifications are not an unmixed blessing. This is not the fault of the specification business. It is rather the fault of those who misuse the specification. And either producers or consumers may be at fault in this regard. Take cement specifications as an example.

The Government is a large purchaser of cement. Years ago it decided that a standard specification for portland cement should be drawn. The Bureau of Standards proceeded on this task and drafted an eminently satisfactory series of requirements. Shortly the whole industry operated under this specification, quality grades virtually disappeared, and competition was in one way simplified. But in other respects it took on new and somewhat vicious characteristics. No chemical engineer is unaware of the disadvantages to the cement manufacturing industry which have grown out of this restriction of competition because of the misuse of quality specifications. Chemical engineers should, therefore, see to it that in prescribing standards for chemicals, and more particularly in using them, like trade difficulties do not grow up to supplant mere difficulties of quality agreement.

The case of cement is an important example of another characteristic of specification making. The Government first drew the specifications for its own use; manufacturing industry adopted them; finally, commercial purchasers began to use the Government specification. In a few chemical fields as well there has been a like trend.

This is a desirable trend, because the Government is often the most skillful of all in drafting specifications. However, in some cases the Government purchaser is more fussy about detail than necessary; and in a few cases the Government requires a higher quality of product than is really needed for many trade applications. Indiscriminate adoption of Government purchase specifications, therefore, should be avoided.

No specification is better than the means available for policing it. This is an axiomatic principle far too often forgotten. In the chemical business there is no excuse for forgetting it. Such policing of a specification involves two usually independent operations. In the first place, deliveries of materials must be sampled. The sampling of chemical deliveries is an art in itself. Far too often this art is practiced by a slovenly sample boy. Sample boys are good only to the extent that they are trained and conscientious at their task. But the sample boy, however well trained and however conscientious, cannot do the impossible. Hence the inherent limitations of sampling itself must be taken into account in the drafting of specification requirements.

The second stage of policing is the analysis or testing of the samples taken. The precision of analysis or test should be in most cases at least as great or greater than the available possibility of sampling. But even this care in selection of laboratory method can be overdone. It is futile to make a test of material more accurate than the significance of the results to be effected in the user's application of the commodity. Common sense, guided by intimate study of the meaning of tests, must, therefore, be generously mixed into a specification program.

After reaching a careful determination of the quality of material required, and determining that this quality is policeable in practice, then there must be just as clear an understanding between buyer and seller as to agreed test procedures as there is regarding the numerical values of the specification itself. This is particularly true of empirical characteristics of commodities. But it is true even of such a thing as the factual numerical values defined, either as to the principal constituent wanted or as to impurities that must be eliminated. Oftentimes the severest controversies between buyer and seller come about through different laboratory methods used by the two parties. Yet, either laboratory method might be perfectly satisfactory for the purpose in question, if both parties had agreed to use it.

At the present time there are probably far too many quality grades and specialized requirements involved in chemical marketing. Producers well know that they can manufacture much cheaper in quantity, even if higher quality is required. Hence oftentimes a merging of customer needs into a common specification would make the deliveries cheaper for every purchaser.

It is not desirable, however, for each manufacturer of a chemical to go ahead on his own in these matters. Joint action of competitive producers in the formulation of specifications that can be made generally acceptable is usually an economy in the end. There is no finer field for cooperation trade association work than in this one of specifications.

Furthermore, there is no finer opportunity for improving relations between a whole producing group and the many consuming units than that which comes about through cooperation in specification drafting. The acquaintanceship which comes through good-natured give and take of such proceedings will smooth out marketing problems, even many of those which have nothing to do with specifications or quality of product. Progress in the direction of more and better specifications for chemicals should, therefore, be welcomed by all divisions of chemical industry.

Classifying CHEMICAL CODES

BECAUSE the basic code of the chemical manufacturing industry as presented by the Chemical Alliance, Inc., and approved by President Roosevelt a year ago (see *Chem. & Met.*, Feb., 1934, p. 59) contained no provisions for trade practices, minimum prices and cost methods, many have assumed that other subsidiary and related codes were similarly drawn. That this is far from true was evidenced from an exhaustive analysis recently completed by the Research and Planning Division of N.R.A. This covered in all, 677 codes and supplements including all those approved and amended as of the middle of October, 1934. The various A.A.A. codes and those whose trade practice provisions are under the jurisdiction of the Federal Alcohol Control Administration as well as the Service Trade Codes have not been included. This study was directed primarily toward the provisions relating to minimum prices and cost methods, and was summarized in an extended tabulation released last month as report No. 9292.

Certain portions of this summary as it relates particularly to the 69 codes classified under Group IV "Chemicals" is presented on these pages. Attention should be called to the fact, however, that included with "Chemicals, Drugs and Paints" in Group IV are some 35 codes for the paper, paper products and rubber industries. These are not shown in the accompanying chart but are included in the tabulation of codes from Group IV, classified according to their price and cost provisions.

The more strictly chemical codes are listed in Table I, and through the cooperation of the Research and Planning Division of N.R.A., *Chem. & Met.* is able to show the detailed classification of their price and cost provisions. The figures directly following the name of each code refer to the numbered paragraphs in the condensed summary given in Table II.

In presenting this study, the Research and Planning Division points out that a certain amount of duplication exists in the sense that a single code may contain several different classifications of minimum price and costing provisions. A single code, moreover, may include more than one provision under any one of the general classifications which on the surface might appear to contain only mutually exclusive items. A single code, for example, may both prohibit the scale below "individual" costs and below

Codes for Chemicals, Drugs and Paints

(Figures refer to Minimum Price and Cost Provisions shown in accompanying analysis of all N.R.A. codes.)

1. Chemicals.

(a) Chemicals Manufacturing

Code No. 20. Salt Producing Industry, 5-10-11-16-21-24
67. Fertilizer Industry, 5-8-11-12-19-20-24-32
155. Oxy-Acetylene Industry
275. Chemical Manufacturing
275A. Agricultural Insecticide & Fungicide, 2
275B. Carbon Dioxide
275C. Industrial Alcohol, 4

(b) Industrial Chemicals.

110. Hardwood Distillation, 5-10-11-12-19-20-24-32
300. Lye Industry
374. Tanning Extract
469. Sulphonated Oil Manufacturing

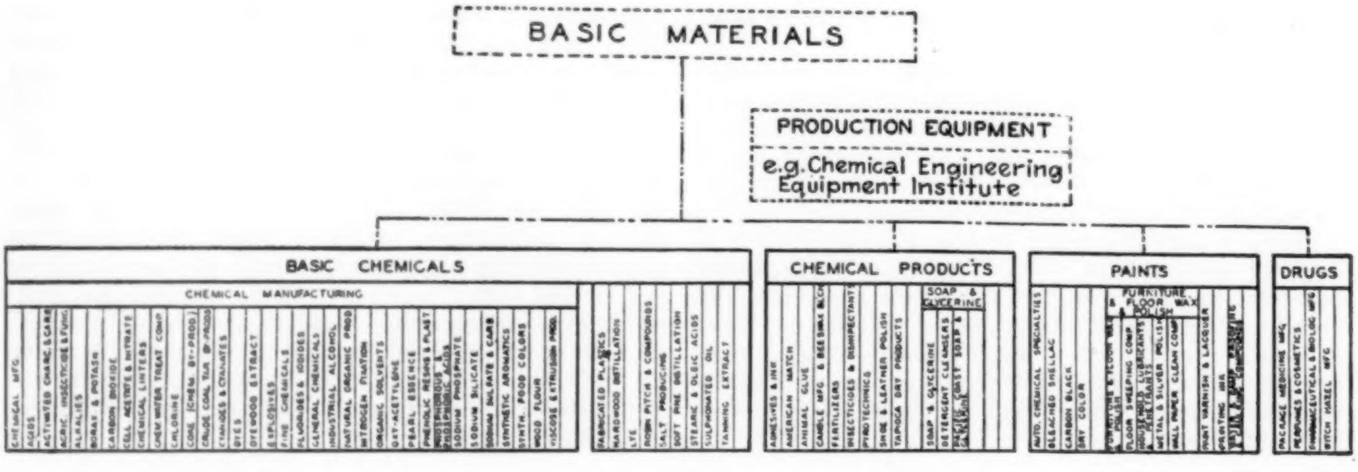
(c) Chemicals Products.

83. Soap and Glycerine Manufacturing 1-5-10-11-19
83A. Soap and Glycerine Mfg. (Pacific Coast) ,3
148. Pyrotechnic Manufacturing 1-10-5-11-19-25-26-30-34
184. Shoe and Leather Finish, Polish, and Cement 16-3-5-10-11
195. American Match Industry, 5-10-11-16-20-24
302. Candle Mfg. and Beeswax Bleachers & Refiners, 7-10-11-19
328. Tapioca Dry Products, 5-10-11-19-21-24
391. Insecticides and Disinfectants, 7-10-11-19-25-26
501. Animal Glue
521. Adhesive and Inks

2. Paint and Drug Groups.

Code No. 71. Paint, Varnish & Lacquer, 5-6-8-11-13-18
140. Waterproofing and Dampproofing, Caulking, compounds and concrete floor treating, 5-8-9-11-14-18
224. Furniture and Floor Wax & Polish, 3-5-8-11-12-19-21-24
269. Carbon Black Manufacturing Industry
339. Printing Ink Mfg. Industry
403. Bleached Shellac Industry, 5-10-11-12-15-18-21-24
407. Dry Color Industry
522. Automotive Chemical Specialties, 35
251. Witch Hazel, 36
361. Perfumes, Cosmetics and Toilet Preparations, 36
430. Package Medicine Manufacturing
529. Pharmaceutical & Biological Industry

CHEMICALS-PAINTS-DRUGS



An Analysis of N.R.A. Code Provisions Relating to Minimum Prices and Cost Methods

	I Food	II Textile	III Basic Materials	IV Chemicals	V Equipment	VI Manufacturing	VII Construction	VIII Public Utilities	IX Finance, Graphic Arts, Amusements	X Professions	XI Wholesale and Retail	Total
Total Number of Codes	**27**	**94**	**83**	**69***	**115**	**158**	**21**	**14**	**15**	**7**	**74**	**677**
Provision for Establishing Minimum Prices in Cases of Emergency Only												
1. Code Authority, subject to NRA approval, determines when an emergency exists and establishes minimum price based on lowest reasonable cost	6	7	5	3	48	25	1				3	96
2. As patterned after above but with variations in word or minor variations in substance	1	6	1	1	1	7	1	1			6	25
3. NRA declares emergency and establishes minimum price	5	2	4	3	13	16		1			11	55
4. As patterned after above but with variations in word or minor variations in substance		2	4	1		1		1	1		2	12
Prohibition Against Selling Below Cost												
A. Definition of cost												
5. Individual (Individual member's own cost)	14	57	49	44	87	75	12	2	4	4	4	352
6. Reasonable.		2		1	2	3			2			10
7. Lowest representative			3	2	2					1		8
B. Elements of cost specified												
8. Production and other costs	2	4	10	6	12	10	5	1	4			54
9. Specified percentage mark-up on a uniform base for overhead costs			2	1	3	4						10
10. No elements of cost specified	12	50	31	40	72	66	7	5	1	4		288
Provision for accounting, estimating for finding methods to be used in determining costs in connection with the "no selling below cost" provisions												
11. To be determined by Code Authority	14	57	49	46	79	73	10	5	4	3	17	357
12. Approval of NRA required	11	50	46	42	73	70	10	5	4	2	17	330
13. Methods named in and established by Code	1	1	7	1	7	2			4			23
14. Individuals permitted slight variations from methods established	2	8	4	1	28	15	2	1	1		4	66
15. Preliminary rules established with or without approval of NRA to apply prior to the approval of methods	4	2	6	27	1	2	4		3			49
16. Cost data must be submitted to Code Authority or Impartial Agent at its request	1	6	8	23	12	10	1	1	1		1	64
17. Provision for investigation by Code Authority or Impartial Agent of members' costs at any time	1	1	2	4		2	1	1	1		1	14
18. Provision for investigation by Code Authority or Impartial Agent of members' costs in cases of violation of disputes only		1	2	3	4	4	3		1			18
19. No provision for cost filing or cost investigation	12	54	41	18	77	63	9	4	2	4	35	319
Exceptions permitted to minimum prices												
A. To meet competition of other members of the industry												
20. Any prices established by competitors	2	8	23	8	20	10	1		1		5	78
21. Prices of competitors not selling below cost	9	16	7	26	8	19	5		2		19	111
22. Prices of lower-cost competitors	3	18	11	1	24	18			1	1	1	78
23. Only upon notice to Code Authority	5	2	9	1	14	17			1		14	63
24. No conditions	9	36	29	35	34	31	5		2	2	10	193
B. When selling sub-standard or distressed goods and during special sales												
25. Approval of Code Authority required	3	19	11	27	32	12					12	116
26. Notice to Code Authority required	4	32	17	30	63	42					19	207
27. At specified time prior to the making of such sales	1		4	1	25	20					6	57
28. Other conditions	4	17	2	3	16	5	2				12	61
C. Miscellaneous exceptions												
29. When meeting competition of certain specified and definitely competitive products				1	10	1						12
30. When selling to other members of the industry	1		2	1	1	5					2	12
31. When fulfilling contracts made prior to effective date of minimum price provision			3	14	2	1			2		5	27
32. Other	1	5		2	3	3		2	1		6	23
33. Only upon notice to Code Authority	1	2	4	1	12	5					1	36
34. No conditions	1	3	9	15	19	15		1	1		11	75
Promulgation of Cost Finding and Accounting Methods Provided for but Used as Basis for Minimum Prices Not Mandatory												
35. Methods determined by Code Authority with approval of NRA shall be made available to members but are not to be used as basis for minimum prices	4	5	8	1	9	12	2	2			8	51
36. Methods which while mandatory upon members in respect to their own accounts are not used in connection with "no selling below cost" provisions	3	7	5	5	42	4	2	2	1	1	3	75

*In addition to Chemicals, Paints and Drugs, N.R.A. Group IV includes some 35 codes for the Paper, Paper Products and Rubber Industries.

"reasonable" costs; or a single code may both provide for the determination of cost accounting methods by the Code Authority and set forth specific matters for computing certain costs.

In drawing the line between provisions which have been included as relating to "minimum prices" and a number of other code provisions, customary usage and understanding have been relied on by the Division. The types of provisions included, for the most part, are apparent and self-explanatory. Provisions frequently considered to relate to minimum prices which have not been included are those which provide for maximum cost, quantity or trade factor discounts; minimum interest rates; basing point provisions; open price reporting provisions; resale price maintenance when imposed by the manufacturing group; and provisions prohibiting special services rendered by the seller unless "fair" or "reasonable" charges are made for them.

As this is written an important conference is underway in Washington at which more than 2,000 members of the various code authorities, business and industrial leaders are presenting complaints and recommendations on all phases of price and cost control. The meeting was warned at the outset that unless industry could prove its case for these provisions, most of them would be removed from present and future codes.

Certain process industries, such as fertilizer manufacture, strongly opposed any effort made to remove minimum prices provisions from their code. Speaking for the Code Authority in that industry, Dr. Charles J. Brand stated that these provisions had "profoundly decreased fraud and misrepresentation and destructive price cutting which in 1931 and 1932 threatened the industry with self-destruction." Most of the more strictly chemical codes are less affected, that for the chemical manufacturing industry not at all. Others who defended the price provisions included Henry S. Dennison of the Dennison Manufacturing Co. and John W. O'Leary of the Machinery and Allied Products Institute. Pressure to have the provisions eliminated has come principally from consumer groups who hold that "price-fixing is much more widespread than specific code provisions authorize and does not permit the results of efficient management to be passed on to consumers in the form of lower prices."

Process Industries

Continue to

Despite the all but universal curtailment in manufacturing operations since peak days of 1929, the process group of industries again increased its percentage in the total production of American industry.

WITHIN the present month have become available the official figures of the U. S. Census of Manufactures which reveal some interesting and valuable measures of relative industrial activity. Again the process industries, i.e., those utilizing chemical engineering in their production processes, have increased their share in the total for "all industry." In other words they have followed the downward trend to a lesser degree than industry as a whole and now hold, therefore, a more prominent place than ever before in our industrial set-up.

It is of interest to trace the progress of this group since the beginning of the century by means of the accompanying chart. Here the value of products for the process industries is compared with the total for all industries in each of the biennial censuses since 1899. While the most precipitous rise in this ratio has occurred since 1929, it is significant that it has usually increased in times of depression such as 1914, 1921, 1931 and 1933, while there were striking recessions in such "good" years as 1923 and 1929. This would seem to mean that the process group holds to a more stable diet, less affected by either feast or famine. Certainly the record during the depression from which we are now emerging is evidence of unusual stability.

The process industry totals for the new census are compared with those for 1931 and 1929 in the tabulations at the bottom of these pages. Through the courtesy of the Census Bureau, preliminary totals for all industry have been made available to show the number of establishments, wage earners and value of products. It will be noted that plants and employees, as well as output, for the process industries, gained in their percentage of the respective totals.

"Chemicals Not Elsewhere Classified"

For the benefit of close students of census statistics, it should be pointed out that in certain respects the 1933 Census will not be directly comparable with its predecessors. In order to facilitate the preparation of returns by the smaller manufacturers, an abbreviated schedule was used for canvassing such manufacturers in many industries, including the group most important to *Chem. & Met.* readers, namely, "Chemicals Not Elsewhere Classified." This schedule called merely for data on employees and their compensation, cost of material, fuels, etc., and total value of products. As it did not provide for any detailed data as to kinds and quantity of products, it has been necessary to present in Table I, the

	Number of Establishments			Number of Wage Earners			Wages — Dollars		
	1933	1931	1929	1933	1931	1929	1933	1931	1929
Chemicals	2,074	2,229	2,508	103,597	100,573	132,758	89,417,794	102,633,829	152,875,427
Ceramics, Brick and Clay Products	1,163	1,570	2,113	55,376	78,473	129,632	36,430,146	71,706,516	151,780,650
Coke Oven Products	97	112	153	13,066	14,383	20,552	15,526,645	22,134,487	33,389,425
Drugs, Medicines and Cosmetics	1,878	2,376	2,792	31,344	34,360	40,908	29,373,523	36,594,428	45,836,942
Explosives and Fireworks	96	115	145	5,088	6,083	7,425	4,838,100	6,669,103	10,418,485
Fertilizers	522	599	638	13,058	14,551	20,926	7,273,317	12,145,966	17,883,925
Glass and Glassware	213	229	263	49,763	49,917	67,527	45,222,718	57,881,550	87,795,111
Glue, Gelatin and Adhesives	118	141	158	2,226	2,841	3,407	2,269,812	3,675,457	4,783,018
Leather, tanned	373	418	471	44,188	42,047	49,932	43,072,949	49,541,526	63,413,707
Lime and Cement	315	367	411	21,801	31,023	41,922	17,949,034	35,895,918	58,325,410
Gas, Manufactured	542	638	754	*26,250	34,523	43,065	36,980,760	49,442,399	61,060,382
Oils and Greases, Animal and Vegetable	908	1,015	1,153	23,867	21,376	28,091	15,307,833	20,392,316	29,178,038
Paints and Varnishes	959	1,039	1,063	22,795	22,521	29,211	23,653,615	29,424,646	42,244,695
Paper and Pulp	779	848	883	107,299	107,902	128,049	99,194,024	126,885,792	173,077,781
Petroleum Products	390	376	390	69,055	68,824	80,596	89,701,561	107,424,117	131,176,993
Rayon and Allied Products	34	32	29	44,306	38,735	39,106	38,612,632	38,231,493	44,697,129
Rubber Goods	408	453	525	106,255	99,259	149,148	99,119,551	112,596,379	207,305,857
Soap and Cleaning Prep	545	636	711	16,490	16,612	17,076	17,031,856	20,708,780	22,350,817
Sugar	170	154	173	24,467	20,128	23,727	24,434,841	24,428,245	29,513,699
Other Products	1,134	1,240	1,267	37,612	39,666	53,474	33,727,706	45,017,148	71,947,550
Total for Process Industries	12,718	14,587	16,600	817,903	843,797	1,106,532	769,138,417	973,430,095	1,439,055,041
Total for All Industries	143,000	175,463	210,959	6,100,000	6,537,133	8,838,743	....	7,255,691,536	11,620,973,254
Per Cent of Total by Process Industries	8.9	8.3	7.9	13.6	12.9	12.5	....	13.4	12.4

*Does not include 4,336 wage earners engaged in distribution.

Grow

Table I—Summary for "Chemicals, n.e.s.," for 1929-1933

	1933	1931	1929
Number of establishments	542	558	551
Wage earners (average for the year)	53,190	48,522	62,199
Wages	$59,228,692	$66,360,107	$94,680,013
Cost of materials, containers, fuel, and purchased electric energy	$221,453,010	$246,068,398	$363,576,811
Products, total value	$476,502,663	$533,175,179	$738,048,386
Chemicals, value	$427,509,191	$490,902,870	$671,767,066
Other products, not normally belonging to the industry, value	$39,149,284	$42,272,309	$66,281,320
Chemicals and products not normally belonging to the industry, not reported separately, value	$9,844,188	....	....
Value added by manufacture	$255,049,653	$287,106,781	$374,471,575

Table II—Values by Chemical Groups, 1933 and 1931

Kind	1933	1931 Adjusted for comparison with 1933	1931 As published
Chemicals, aggregate value	$491,733,987	$557,649,475	$575,828,560
Made in the "Chemicals not elsewhere classified" industry	427,509,191	478,615,506	490,902,870
Made as secondary products in other industries	39,540,601	52,010,858	57,718,419
Intergroup duplication	24,684,195	27,023,111	27,207,271
Chemical Groups.			
I.—Acids	52,710,204	60,763,329	66,432,788
II.—Nitrogen and fixed-nitrogen compounds	30,966,361	33,281,996	33,483,281
III.—Sodium compounds	97,647,767	108,591,274	108,591,274
IV.—Potassium compounds	7,433,609	7,915,554	8,112,469
V.—Aluminum compounds and alums	10,756,618	10,760,635	10,760,635
VI.—Coal-tar products	106,262,925	98,574,282	103,088,441
VII.—Plastics	185,956,503	237,762,405	27,847,230
VIII.—Chemicals, miscellaneous			217,512,442

total "value of products," $9,844,188, reported on this abbreviated schedule as the value of "chemicals and products not normally belonging to the industry, not reported separately."

This amount is equal to only 2.1 per cent of the total value of all products of the industry, but for certain chemical groups, the percentages are somewhat larger. Consequently the product values for 1933 for the several chemical groups are not strictly comparable with the corresponding figures for 1931, as originally published. It has been necessary, therefore, to exclude from Table II all production data reported in the abbreviated schedule, and to adjust the 1931 figures (see second column) by deducting the value of the several groups of products made by establishments corresponding to those which reported on the abbreviated schedule for 1933.

Likewise in the tabulations of statistics headed "Most Recent Census Data" that appear on the following pages, all 1931 figures have been similarly adjusted for direct comparison with those for 1933 in the few cases where abbreviated schedules have been used. Some idea of the extent of this adjustment is evident in the several group comparison in Table II.

Cost of Materials, Containers, Fuel and Power Dollars			Value of Products — Dollars			Value Added by Manufacture — Dollars		
1933	1931	1929	1933	1931	1929	1933	1931	1929
299,928,111	328,853,962	508,152,499	702,963,724	762,073,295	1,090,930,252	403,035,613	433,219,333	582,777,753
32,667,325	53,823,391	110,686,054	107,978,000	194,469,268	411,472,613	75,310,675	140,645,877	300,786,559
123,275,080	162,793,117	281,592,430	165,731,226	226,509,038	416,348,458	42,456,146	63,715,921	134,756,028
118,872,921	152,637,240	202,519,777	401,469,978	531,296,386	646,795,185	282,597,057	378,659,146	444,275,408
13,674,457	20,924,503	34,228,924	37,625,950	49,980,456	79,123,226	22,951,493	29,055,953	44,894,302
69,054,012	106,481,104	159,801,195	94,958,766	154,349,887	232,510,936	25,904,754	47,868,783	72,709,741
63,445,955	73,574,568	103,293,943	191,985,322	216,264,830	303,818,560	128,539,367	142,690,262	200,524,617
9,622,996	17,349,174	22,646,734	19,641,197	31,136,522	39,096,406	10,018,201	13,787,348	16,449,672
138,176,928	172,785,669	337,597,868	237,202,228	271,137,694	481,340,299	99,025,300	98,352,025	143,742,431
33,475,002	64,993,392	109,150,257	103,121,331	171,044,867	303,324,918	69,646,329	106,251,475	194,174,661
†79,188,680	152,579,762	188,416,183	†291,092,688	467,751,449	512,652,595	†211,904,008	315,171,687	324,236,412
164,160,008	260,488,904	470,996,141	232,050,507	344,601,098	601,308,320	67,890,499	84,112,194	130,312,179
155,381,195	193,736,737	334,132,065	288,916,047	350,725,652	568,975,838	133,534,852	156,988,915	234,843,773
393,663,024	495,088,615	723,360,707	696,289,299	851,530,240	1,206,114,305	302,626,275	356,441,625	482,753,598
1,064,137,795	1,210,517,315	2,031,341,408	1,378,838,372	1,524,284,997	2,639,665,001	314,700,577	313,767,682	608,323,593
44,031,316	36,180,858	33,334,753	156,931,519	132,632,416	149,546,107	112,900,203	96,451,558	116,211,354
211,396,722	252,867,163	578,677,681	472,743,587	614,265,307	1,117,460,452	261,346,865	361,398,144	538,782,571
107,815,732	138,808,348	199,752,025	240,378,108	305,726,048	360,971,162	132,562,376	166,917,700	161,219,137
369,250,981	408,264,984	521,582,617	482,441,699	494,956,767	634,267,635	113,190,718	86,691,783	112,685,018
145,885,195	228,201,185	399,564,487	292,516,933	409,832,954	683,646,247	145,137,409	181,631,769	284,081,760
3,637,103,435	4,530,949,991	7,350,827,748	6,594,876,481	8,104,569,171	12,479,368,515	2,955,278,717	3,573,819,180	5,128,540,567
....	21,517,179,976	38,549,579,732	31,400,000,000	41,521,147,127	70,434,863,443	....	20,003,967,151	31,885,283,711
....	21.0	19.0	21.0	19.5	17.7	....	17.9	16.1

†Does not include gas purchased and resold.

MOST RECENT CENSUS DATA

ACIDS

All figures refer to production for sale, except as otherwise noted

	1933	1931
Total value of production for sale	$52,710,204	$60,763,329
Acetic		
Dilute, basis 100%—		
Pounds	28,791,065	48,846,511
Value	$2,078,916	$2,761,237
Glacial—		
Pounds	36,359,413	13,739,589
Value	$2,223,965	$776,251
Boric (boracic):		
Pounds	21,612,634	18,127,718
Value	$844,564	$970,383
Carbonic (carbon dioxide):		
Pounds[1]	116,861,428	153,574,997
Value	$4,463,857	$6,225,643
Chromic		
Pounds	4,969,047	3,024,854
Value	$537,378	$423,069
Citric		
Pounds	5,695,793	8,381,441
Value	$1,795,382	$3,060,185
Hydrochloric (muriatic) basis 100%:		
Tons	44,895	40,687
Value	$2,386,790	$2,422,439
Mixed (sulphuric-nitric):		
Tons	41,962	37,586
Value	$1,883,320	$1,800,480
Nitric, basis 100%:		
Tons	32,839	31,421
Value	$2,969,013	$3,381,554
Oleic		
Pounds	27,889,748	25,706,978
Value	$1,394,133	$1,602,996
Phosphoric, basis 50%:		
Pounds	23,920,525	19,096,150
Value	$891,565	$761,354
Stearic		
Pounds	23,874,417	23,431,576
Value	$1,878,115	$1,917,512
Sulphuric, basis 50 deg. Be.:		
Tons	[2]4,018,722	5,258,117
Consumed where made; tons	651,964	1,855,489
For Sale—		
Tons	3,366,758	3,402,628
Value	$23,719,188	$27,873,987
Tannic		
Pounds	684,462	667,212
Value	$236,125	$250,874
Tartaric		
Pounds	6,798,855	5,181,020
Value	$1,492,871	$1,462,529
Oxalic		
Pounds	9,223,062	
Value	$903,254	
Pyrogallic		$5,072,836
Pounds	72,553	
Value	$100,414	
Other acids, value	[3]$2,911,354	

[1] Includes approximately 64,500,000 lb. piped to plants making "dry ice" in 1933 and approximately 80,000,000 lb. so used in 1931. [2] Production in chemicals, fertilizers, and explosives industries only. Data for production from smelting and refining of copper, lead, and zinc in 1933 not available; 1931 figures in second column adjusted accordingly. [3] Includes, in order of rank, value of acetic anhydride, hydrocyanic, formic, hydrofluoric, reclaimed sulphuric, lactic, etc.

NITROGEN COMPOUNDS

	1933	1931
Total value[1]	$30,966,361	$33,483,281
Ammonia, aqua and liquor:		
Pounds (NH_3 content)	16,493,441	18,830,923
Value	$916,345	$1,031,748
Ammonia, anhydrous:		
Pounds	160,193,292	127,098,718
Value	$7,516,279	$8,043,679
Other ammonium compounds, value	$3,555,540	$3,418,682
Cyanogen compounds:		
Copper cyanide—		
Pounds	551,590	
Value	$209,117	$5,724,700
Other cyanides and hydrocyanic acid, value	$4,503,820	
Nitric acid, basis 100%		
Tons	32,839	31,421
Value	$2,969,013	$3,381,554

[1] Not including value of ammonia and ammonia products made in the coke and manufactured gas industries. [2] Includes, in order of magnitude, value of sodium nitrate, silver nitrate, sodium nitrite, bismuth subnitrate, potassium nitrate, gaseous nitrogen, etc.

Better to Serve the

Authoritative reviews, technical developments and economic trends that point the way toward improved relations between producer and consumer

ACETIC ACID

By F. J. Curtis
Director of Development
Merrimac Chemical Co., Boston, Mass.

PRIMARY PRODUCTION of acetic acid as such and its simple derivatives in 1933 reached 104,000,000 lb. of 100 per cent acid equivalent, which is 81.5 per cent of its record output of 1929 and slightly greater than the 1927 output. During these years from 1927 to 1933 a profound change took place in the sources of this important product. In 1927, 85 per cent came from calcium acetate, one of the three joint products of the hardwood distillation industry. By 1933 this percentage had dropped to 25 per cent, although the total tonnage from all sources was nearly the same in the two years.

Production data, in terms of 100 per cent acetic acid, are summarized in the accompanying table, from the U. S. Tariff Commission.

The wood-distillation industry has greatly reduced production of calcium acetate in this period, partly because of declining operation of the industry as a whole, but to a considerable extent also because of substitution of direct recovery of the acid. The decline indicated in the table is, in fact, deceptive, unless one realizes that much of the acetic acid in pyroligneous liquor is now recovered in forms other than the once universal, calcium acetate.

The wood chemical industry is one that has worked out co-operative selling more than most, partly due to the small production units, partly from the fact that the customers for calcium acetate are relatively few in number. The conversion of the calcium acetate to acetic acid is a chemical engineering operation and sale of acetic acid involves dealing with large numbers of customers and large tonnages. Small units could not afford the chemical engineering supervision and skill necessary, and would have to purchase sulphuric acid whereas most converters of acetate of lime are manufacturers of this essential. Furthermore, sales of acetic acid go along well with sales of other chemicals to the same consumers so that the converter again has an advantage.

The synthetic manufacturers however are under no such disadvantages. They are accustomed to manufacture on a large scale and to sell to the chemical markets; they are well equipped with chemical engineering skill, and they make the final product, not an intermediate one.

In actual large scale operation there are three synthetic processes: (1) from calcium carbide through acetylene and acetaldehyde, (2) by bacterial oxidation of ethyl alcohol, and (3) by processing oil refinery gases.

Obviously any source of acetaldehyde may be used for acetic synthesis. An interesting development is the experimental operation of a plant at one

Domestic Production of Acetic Acid Classified by Sources, 1927-33

(In Thousands of Pounds)

Year	Primary production: From calcium acetate[1]: Dom. cal. acetate[2]	Imp. cal. acetate[3]	Total	By other methods[4]	Total[4]	Percentage of total represented by: Calcium acetate	Other[4]
1927	82,966	3,939	86,905	15,488	102,393	84.9	15.1
1928	87,217	5,146	92,363	20,146	112,509	82.1	17.9
1929	71,273	14,048	85,321	42,443	127,764	66.8	33.2
1930	37,292	7,920	45,212	44,404	89,616	50.5	49.5
1931	33,482	0	33,482	51,703	85,185	39.3	60.7
1932	22,940	0	22,940	48,516	71,456	32.1	67.9
1933	25,294	150	25,444	78,519	103,963	24.5	75.5

[1] Converted on the basis of one lb. of 100 per cent acetic acid to 1.75 lb. of 80 per cent calcium acetate.
[2] Based on monthly reports of the Bureau of the Census and adjusted for stocks on hand at beginning and end of year.
[3] Assuming conversion to acid during year of importation.
[4] Including acetic acid equivalent of derivatives

Consumer

of Chemicals

of the oil refineries where petroleum hydrocarbons are being converted into acetylene by means of the electric arc. (See *Chem. & Met.*, June, 1934, p. 290.) This reaction has been often reported in the literature and if the problems of concentration and power cost are solved it can easily be seen that a huge field of potential raw material for acetic acid will be opened up.

Much study is also being given to the catalytic oxidation of ethyl alcohol and several pilot plants are understood to have been placed in operation. This reaction is being carried out on a large scale in England. In the literature the conversion of methanol to acetic acid by means of carbon monoxide at high pressures has also been reported.

But the wood distillation industry is still fighting. During the last few years a number of attempts have been made to short circuit by "direct" recovery the more cumbersome manufacture of calcium acetate, shipment to the converter's plant, subsequent decomposition with sulphuric acid, followed by shipment to the final consumer. These processes may remove water by addition of an organic solvent such as ethylene dichloride which forms with water a mixture boiling lower than acetic acid, or the weak acetic acid may be extracted in the liquid phase by solvents such as ether or ethyl acetate or in the vapor phase by tar oils. More technical skill is required than for wood distillation and the existence of the industry in small units has handicapped the widespread adoption of these processes.

A plant has also recently been installed in Pennsylvania at a 60 cord wood distillation unit which is said to be low enough in first cost and operation expense to be applicable to even smaller outputs. A description of this process may be expected in *Chem. & Met.* early in 1935. (See also Feb., 1934, p. 81 and Nov., 1934, p. 599.)

It would seem to the writer that the wood distillation industry could well study the extension of its marketing cooperation to the installation of individual extraction plants for the crude acid, and ship the crude concentrate to a central cooperative refinery. The difficulty of building up marketing facilities is obvious and the tendency is still to sell the output to a chemical company which has such selling forces, thus taking away one of the expected benefits of the "direct" process.

ACETONE and BUTANOL

By William Mueller
Sales Manager
Commercial Solvents Corp.,
New York.

ACETONE consumption in 1934 was probably the largest in history due in a considerable measure to the way cellulose acetate has forged ahead in the field of film, plastics and synthetic fiber. This has placed an unusual demand on production facilities, and despite capacity operations, stocks of acetone in the hands of both producers and consumers have had to be drawn upon to a considerable degree. This condition was foreseen some months ago by our own company and a plant expansion program is under way in Peoria, which should increase and improve service to consumers of acetone.

Butanol production and consumption averaged about 30 per cent more in 1934 than in the preceding year. Furthermore, a continued expansion is anticipated for the current year, due primarily to three types of developments: (1) New uses have developed during the past year for butanol and its derivatives quite outside of the lacquer field. Some of these uses have grown from gallons to tank-car requirements. Others show promising trends. (2) Everything points to further expansion of the automobile industry in 1935, with prospective increase in its requirements for lacquer. (3) Many new uses are developing for lacquer outside of the automobile field.

MOST RECENT CENSUS DATA

Nitrous oxide:		
Thousands of gallons	82,220	94,607
Value	$810,329	$922,626
Other nitrogen compounds and gaseous nitrogen, value	[2]$10,485,918	$10,960,292
SODIUM COMPOUNDS	1933	1931
Total value	$97,647,767	$108,591,274
Benzoate		
Pounds	329,206	688,248
Value	$106,735	$249,039
Bichromate and chromate		
Tons	27,234	24,745
Value	$3,280,994	$3,162,482
Borate (borax)		
Tons	93,813	80,004
Value	$3,163,335	$2,432,172
Carbonates		
Bicarbonate, refined—		
Tons	129,273	127,981
Value	$3,585,862	$3,730,716
Soda ash—		
Total production, tons	2,322,832	2,275,416
Consumed where made tons	668,804	766,737
For sale—		
Tons	1,654,028	1,508,679
Value	$24,182,681	$22,492,943
By process—		
Ammonia soda—		
Tons	1,585,633	1,422,614
Value	$23,163,690	$21,079,187
Natural—		
Tons	68,395	[1]86,065
Value	$1,018,991	$1,413,756
Modified soda		
Tons	21,873	[2]
Value	$775,805	[2]
Caustic (hydroxide)		
Primary production[3]		
Total, tons	686,983	658,889
Consumed where made tons	42,252	24,676
For sale—		
Tons	644,731	634,213
Value	$24,478,385	$26,565,202
By process—		
Lime soda, tons[4]	439,363	455,832
Electrolytic tons	247,620	203,057
Citrate		
Pounds	1,599,161	1,370,561
Value	$407,718	$409,124
Hypochlorite		
Tons	34,773	32,323
Value	$2,445,221	$2,573,628
Iodide		
Pounds	36,775	47,658
Value	$116,401	$194,526
Phosphates		
Tribasic—		
Tons	79,583	82,954
Value	$3,684,484	$4,675,085
Dibasic—		
Tons	38,354	61,238
Value	$1,396,037	$2,887,390
Monobasic and pyro—		
Tons	2,521	2,111
Value	$539,918	$583,144
Silicate, basis 40 deg		
Tons	630,389	664,452
Value	$6,525,098	$7,501,837
Silicofluoride		
Tons	1,411	1,357
Value	$131,945	$115,169
Sulphates		
Anhydrous, crude and refined—		
Tons	15,660	7,609
Value	$273,867	$169,717
Glauber's salt—		
Tons	37,000	48,899
Value	$560,066	$847,424
Hyposulphite (thiosulphate)—		
Tons	18,211	23,512
Value	$763,476	$969,206
Niter cake (bisulphate)—		
Total production, tons	30,558	35,680
Made and consumed in same establishments, tons	13,546	5,019
For sale—		
Tons	17,012	30,661
Value	$352,512	$563,872

[1]Includes data for electrolytic soda. [2]Included in item for "Other sodium compounds," to avoid disclosing approximations of data for individual establishments. [3]Not including caustic soda made and consumed in the wood-pulp and textile industries. [4]Includes data for output of 2 establishments that made caustic from natural soda ash. [5]Includes, in order of value, data for nitrate, hydrosulphite, ferrocyanide, nitrite, sal soda, aluminate.

MOST RECENT CENSUS DATA

SODIUM COMPOUNDS, Contd.

Salt cake—		
Total production, tons	131,622	119,399
Made and consumed in same establishments,		
Tons	28,538	20,672
For sale—		
Tons	103,084	98,727
Value	$1,351,604	$1,528,032
Sulphide		
Tons	30,732	23,268
Value	$1,353,886	$1,032,811
Sulphite		
Tons	3,372	6,437
Value	$266,339	$568,892
Other sodium compounds,		
Value	[3]$17,719,296	$25,338,863

POTASSIUM COMPOUNDS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Total value	$7,433,609	[1]$7,915,554
Acetate		
Pounds	44,523	80,119
Value	$12,568	$22,816
Bitartrate (cream of tartar)		
Pounds	5,789,150	[1]6,496,444
Value	$890,818	[1]$1,375,422
Citrate		
Pounds	145,556	136,935
Value	$63,362	$72,451
Hydroxide		
Tons	9,348	4,818
Value	$867,860	$580,765
Iodide		
Pounds	479,079	380,047
Value	$1,108,316	$1,290,565
Other (chloride, bichromate, bromide, permanganate, xanthate, etc.), value	$4,490,685	$4,573,535

[1] Adjusted for comparison with 1933.

ALUMINUM COMPOUNDS AND ALUM

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Total value	$10,756,618	$10,760,635
Ammonia alum		
Tons	4,022	4,472
Value	$198,810	$233,556
Aluminum sulphate		
Tons	322,478	309,133
Value	$6,600,001	$6,672,406
Potash and chrome alums		
Tons	1,951	2,596
Value	$110,392	$162,243
Sodium aluminum sulphate		
Tons	18,941	15,944
Value	$1,019,849	$901,529
Aluminous abrasives		
Tons	7,664	7,401
Value	$1,525,141	$1,151,586
Aluminum chloride		
Tons[1]	[2]1,127	[2]1,099
Value	$143,250	$161,786
Aluminum acetate		
Tons	33	
Value	$7,351	$1,477,529
Other aluminum compounds, value	[3]$1,151,824	

[1]Production for sale. Total production of aluminum chloride, including amounts made and consumed in the same establishments, as reported by the Bureau of Mines, was as follows: 1933, 4,765 tons, value $384,581; 1931, 7,121 tons, value $620,860. [2]Reported as solutions of varying strengths; reduced to 100 per cent equivalent. [3]Includes, in order of value, data for sodium aluminate, stearate, hydroxide, etc.

COAL TAR PRODUCTS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Total value	$106,262,925	$100,531,630
Crudes[1]	16,750,551	20,491,752
Intermediates	21,013,212	18,617,651
Finished products, total	68,499,162	61,422,227
Dyes	45,556,835	40,627,100
Color lakes	3,483,276	1,765,611
Medicinals	5,980,332	7,572,929
Flavors	1,974,674	1,957,348
Perfume materials	239,349	684,914
Phenolic resins	7,508,587	7,281,550
Other	3,756,109	1,532,775

[1]Not including byproduct crudes made in coke plants and gas works.

BETTER SERVICE FOR

For example, the application of lacquer to paper seems to offer unusual attraction to the manufacturer of attractive, waterproof containers.

The past year has not revealed any marked change in relations between the producer and consumer of these commodities. The low prices at which the products have been offered has tended to discourage production on the part of consumers who might otherwise be attracted by proposals that they produce their own requirements. Continued research on the part of the producer in cooperation with the consumer has been an important factor in the present situation and promises mutual benefits as new uses are developed in the future.

ALUMINUM CHLORIDE

Editorial Staff Review

WHEN A. M. McAfee of the Gulf Refining Co. last reported on his process of manufacturing anhydrous aluminum chloride at the Philadelphia meeting of the American Institute of Chemical Engineers (See *Chem. & Met.*, July, 1929, 422-4) he suggested the possibility of further marked improvements in manufacture. Mr. McAfee now informs *Chem. & Met.* that the expected improvements have been brought about. The tedious and expensive steps of grinding and briquetting the bauxite and coal described in that article have been entirely eliminated, and refinery coke breeze has been substituted for coal. The elimination of briquets and substitution of refinery coke have resulted in a much simpler process of manufacture.

Mr. McAfee further states that within the past few months his company has built and put into operation at its Port Arthur refinery an Alchlor plant new from the ground up. This plant, which will be described in a later issue of *Chem. & Met.*, embodies a number of interesting features which Gulf's experience in the manufacture of this important chemical have proved to be desirable.

A typical analysis of the technical anhydrous aluminum chloride produced in this plant is as follows: Al_2Cl_6, 90.98 per cent; $FeCl_3$, 6.85 per cent; $SiCl_4$, nil; non-volatiles, 1.39 per cent. Prices as of Dec. 1, 1934 began at 5 cents per lb. for carload lots (45,000 lb. or more) increasing to 9 cents for quantities of 100 lb. or less, containers not included.

AMYL COMPOUNDS

By M. J. Hooper
Sales Manager, Sharples Solvents Corp. Philadelphia, Pa.

DEVELOPMENT of organic compounds from the pentanes has been an unusual and interesting research, both from the technical and economic viewpoints. The first group of consumers to benefit were those engaged in lacquer formulation who, for a number of years, have successfully utilized the mixture of isomeric alcohols offered under the trade name Pentasol and the acetic acid esters known as Pent Acetate. Para-tertiary amyl phenol which was also offered to chemical industries several years ago under the trade name Pentaphen commanded considerable interest and has had an ever broadening field of application.

During the past year three new developments from this field have attracted considerable attention: (1) Mixed amyl chlorides, (2) an odorant for natural gas called Pentalarm and (3) the amylamines. The mixed amyl chlorides stabilized with olefines were first marketed in tank-car quantities early in the Fall of 1934, and were offered at a price that made them the cheapest chlorinated solvents ever available to American industry.

During the course of the past year the amylamines have materially contributed to important advances made in widely separated fields. These amines are strong organic bases, a one molar aqueous solution of monoamylamine having a pH of 11.67 compared with 11.62 for ammonium hydroxide. Diamylamine will displace monoamylamine and triamylamine displaces diamylamine from its salts.

All three of the amylamines react very readily with acids to form salts or soaps, the latter being valuable emulsifying agents. In oil-water emulsions greater stability of emulsion is provided than with the same proportion of other amines heretofore available. The soaps of all three amylamines are completely miscible with both mineral and vegetable oils.

The ability of the amylamine soaps to form stable emulsions is accounted for in part by the effect of these soaps on surface tension. For example, one part of monoamylamine oleate in 32,000 parts of water decreases the surface tension to 39 dynes per sq.cm. Comparative tests with other compounds commonly used for this purpose showed figures of 47 dynes and 53 dynes per sq.cm. It is also interesting that a 0.1 per cent solution of monoamylamine

CHEMICAL CONSUMERS

oleate has a pH of 9.57 and a 1 per cent solution shows a pH only slightly higher, namely 9.61.

Amylamine soaps are used to advantage in the dye bath because of their ability to act as wetting out agents, dispersing agents and penetrants. Emulsions of mineral oils made with these soaps are used in textile lubrication; a proportion of 4 per cent will give an emulsion as satisfactory as that obtainable with 15 per cent of some other products.

In the field of dyestuff intermediates, the amines have proved of real value in the preparation of certain greatly desired colors and shades. Several of these are already on the market and others are in the process of development.

One very interesting use for diamylamine is in the preparation of paraamino diamyl aniline. This compound is an intermediate in the production of inks with unusual properties. It is only one of the large number of mixed amines which can be prepared. The amylamines are in commercial production and complete data are becoming available as the various problems of potential consumers are being studied in our research laboratories.

ANILINE

By F. M. Fargo, Jr.

Vice President
The Calco Chemical Company,
Bound Brook, N. J.

In the twenty years that we have produced aniline oil in this country, that product has had a most interesting history. Although we were among the first to enter the field, by the summer of 1916 there were actually about 45 makers of aniline oil. Some of these produced for the market and some for their own consumption. The price at that time was 65 cents per lb. for large quantities on long-time contracts, up to 85 or 90 cents per lb. for spot delivery. With the first slackening in demand, the price broke very badly and continued to decline rapidly, so that, before the end of 1916, large quantities on contract were being sold freely at 22 cents per lb. There was no question but that this price resulted in a substantial loss for all producers. Small concerns with units hastily constructed to take advantage of the unusual demand existing then, rapidly disappeared. Consumers who were producing for their own needs, promptly shut down their plants and purchased from chemical manufacturers who were seriously in the business of producing aniline, with the result that by the early part of 1917, and there were no more than six producers and probably only five who were actually making important quantities.

During the next two or three years the price fluctuated between 25 and 33 cents per lb. and then, with declining costs of raw materials, gradually dropped to its present level of 14 cents per lb. in tank cars and 16 cents in drum lots.

The interesting part of this production and price history is the very large number of makers of all sorts who swarmed into the field, attracted by the high price, and the very small number remaining after normal conditions brought about the necessity of real efficiency. There is no question but that the present price is only possible by reason of production on a very large scale, and supported by facilities such as only a very large chemical manufacturer would have, including their own production of mineral acids and a very economical supply of other raw materials. It would be quite out of the question for even the larger consumers of aniline to produce their own requirements as cheaply as they can now buy, for these same reasons. The history of the product during the past twenty years has definitely confirmed the wisdom of this viewpoint.

BROMINE

By Max Y. Seaton

Vice-President, California Chemical Co.
Newark, Calif.

Developments in the bromine industry during the past year have concerned themselves primarily with a continued expansion of consumption following the increased use of leaded gasoline and with corollary commercialization of bromine production from seawater by the Ethyl-Dow Chemical Co. at Kure Beach, N. C. (see *Chem. & Met.*, Aug. 1934, pp. 402-4). The reduction in production costs which increased tonnage has brought about, coupled with the assurance that brine reserves are not a limiting factor in the future productive ability of this industry, has led to a renewed scrutiny of bromine as a reagent for organic chemical synthesis. Results of this work may have far-reaching consequences. The use of bromine as a water sterilizing agent also continues to make slow but definite progress.

MOST RECENT CENSUS DATA

MISCELLANEOUS CHEMICALS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Aggregate value	$186,673,094	$237,762,405
Inorganic, total	$94,077,975	$136,025,831
Organic, total	$92,595,119	$101,736,574
Alcohols		
Methanol, synthetic:		
Gallons	8,793,152	7,007,332
Value	$1,680,346	$1,462,272
Other alcohols, not including ethyl,[1] glycerol (see "glycerine"), nor methanol produced by the distillation of wood, value	$3,789,107	$4,886,614
***Amyl acetate**		
Gallons	500,494	473,005
Value	$364,977	$392,361
Antimony		
Oxide, pounds	1,073,846	
Value	$82,167	
Other salts and compounds, value	$301,846	$385,426
Arsenic		
Arsenic oxide, pounds	21,152,574	34,352,500
Value	$569,906	$1,054,106
Arsenate of calcium, pounds	15,487,458	21,982,920
Value	$669,032	$1,094,891
Arsenate of lead, pounds	29,815,818	37,974,038
Value	$2,368,488	$3,674,422
Other salts and compounds, value	$158,497	$108,238
Barium		
Carbonate, pounds	7,235,232	6,595,953
Value	$174,084	$188,180
Sulphate, precipitated ("blanc fixé"), pounds	8,676,391	17,311,982
Value	$261,035	$630,400
Other salts and compounds, value	$452,772	$549,439
Bismuth		
Subcarbonate, pounds	210,773	161,878
Value	$293,728	$259,562
Subgallate, pounds	26,013	26,394
Value	$38,813	$46,318
Subnitrate, pounds	387,743	373,067
Value	$454,575	$532,896
Other compounds, value	$50,684	$43,498
***Butyl-acetate**		
Gallons	2,969,327	4,644,350
Value	$2,184,285	$3,332,592
Cadmium compounds, value	$51,170	$71,253
Calcium		
Chloride, basis 73-79%, tons	158,000	232,057
Value	$2,715,552	$4,725,085
Hypochlorite, tons	30,051	63,793
Value	$1,302,200	$2,074,230
Phosphate		
Monobasic, tons	39,236	36,454
Value	$4,941,220	$5,057,977
Dibasic and tribasic, tons	3,010	4,541
Value	$390,779	$532,748
Carbide, tons	101,488	128,263
Value	$6,059,205	$8,024,029
Stearate, pounds	99,809	104,881
Value	$16,442	$17,165
Other compounds, value	$1,921,137	$3,027,048
***Carbon bisulphide**		
Pounds	90,179,039	83,045,219
Value	$3,282,612	$3,199,896
***Carbon tetrachloride**		
Pounds	30,343,693	34,095,802
Value	$1,354,475	$1,719,796
***Chloroform**		
Pounds	1,770,169	2,134,451
Value	$292,085	$322,656
Chromium compounds, other than of sodium and potassium and chrome tannage, value	$303,581	$212,080
***Citral**		
Pounds	6,929	[2]
Value	$14,342	[2]
Cobalt		
Linoleate		
Pounds	115,436	71,808
Value	$30,567	$23,059
Copper		
Carbonate, pounds	525,570	275,806
Value	$77,724	$40,862
Sulphate (blue vitriol), pounds	55,949,580	60,816,515
Value	$1,403,079	$2,177,070
Cyanide, pounds	551,590	
Value	$209,117	$236,986
Other compounds, value	$201,811	

MOST RECENT CENSUS DATA

MISC. CHEMICALS, Contd.

***Ether**		
Pounds	7,421,283	6,981,845
Value	$1,384,694	$1,471,735
***Ethyl acetate**		
Gallons	4,035,728	4,499,760
Value	$2,132,105	$2,063,308
***Glycerin**		
Crude, pounds[4]	22,161,409	25,964,017
Value	$1,191,000	$1,551,573
Refined, pounds	110,913,657	101,615,158
Value	$8,114,715	$10,222,850
Hydrogen peroxide		
Pounds (basis 100 volume)	12,118,806	8,784,311
Value	$2,388,229	$2,960,846
Iodine, resublimed		
Pounds	83,975	66,735
Value	$223,178	$304,982
Other iodine compounds, value	$272,282	[5]
Iron		
Chloride (crystals and solutions), pounds	9,153,567	7,402,605
Value	$201,253	$195,089
Sulphate (copperas), tons	27,860	30,503
Value	$252,575	$268,107
Ferroalloys (electric-furnace), tons (2,240 lb.)[6]	120,976	130,254
Value	$11,868,027	$13,200,409
Iron-ammonium citrate, pounds	132,192	87,852
Value	$51,399	$52,035
Oxalate, pounds	5,266	
Value	$4,106	
Sulphide, pounds	1,699,689	$699,610
Value	$37,835	
Other salts and compounds, value	$557,980	
Lead salts and compounds, not including arsenate (see "Arsenic") nor pigments, value	$491,804	$145,756
Magnesium		
Sulphate (Epsom salt), tons	37,364	34,340
Value	$1,234,342	$1,524,431
Salicylate, pounds	3,602	
Value	$3,432	$531,772
Other compounds, value	$804,777	
Manganese		
Sulphate, pounds	1,832,045	
Value	$59,270	$183,152
Other salts and compounds, value	$123,860	
Mercury		
Chloride, mercuric (corrosive sublimate), pounds	302,350	285,734
Value	$244,303	$326,575
Ammoniated, pounds	57,475	44,503
Value	$76,296	$81,853
Oxide, pounds	119,028	
Value	$146,577	
Redistilled, pounds	51,380	$540,579
Value	$56,672	
Other compounds, value	$260,037	
Nickel		
Sulphate, pounds	4,217,648	3,791,968
Value	$415,563	$317,583
Other compounds, value	$292,486	$257,414
***Nitrocellulose,** made for sale as such:		
Pounds	25,414,879	23,408,364
Value	$5,003,295	$5,154,930
***Plastics**		
Pyroxylin, total production, pounds	12,945,556	15,009,769
Consumed where made, pounds	2,849,523	3,001,330
Made for sale in form for further manufacture, pounds	10,096,033	12,008,439
Value	$7,799,283	$11,113,618
Finished articles of pyroxylin made in the producing establishments, value	$5,020,356	$3,490,413
Phenolic resins, pounds	41,556,515	33,651,222
Value	$7,508,587	$7,281,550
Cellulose acetate, pounds	8,230,089	
Value	$4,438,699	$2,404,923
Other value	$2,331,013	
Silver		
Nitrate, ounces	4,145,648	4,833,092
Value	$1,071,810	$1,024,154
Other compounds, value	$121,705	$89,580
Strontium compounds, value	$159,962	$124,123
Sulphur,		
Refined, tons	48,663	66,914
Value	$1,736,064	$2,069,345

BETTER SERVICE FOR

INCREASED EFFICIENCY NEEDED

By HARRY L. DERBY

President, American Cyanamid & Chemical Corp., New York

CHEMICAL industry, as is true with most other basic industries, is confronted in 1935 with many problems of great importance. The increased burden of taxation and other factors of cost (which are not compensated for through increase in chemical selling prices), makes it necessary that increased efficiency overcome these handicaps. The chief problems in which uncertainty now exists are those relating to reciprocal tariffs, unemployment insurance, the possibility of inflation and various other matters more or less directly or indirectly concerned with Industry's relationship to the Government. When these uncertainties are removed, I believe chemical industry can be depended upon to continue its progress.

CHLORINE

By C. T. Henderson,

Westvaco Chlorine Products, Inc., New York, N. Y.

THE increasing use of bleached papers, in general, and kraft in particular, offers a larger market for chlorine in this important industry. The consumption of unbleached sulphite pulp in the United States during 1922 was 1,280,000 tons. In 1926 it reached a peak of 1,610,000 tons, falling slightly during 1927 and 1928, then decreasing sharply during the depression to 1,100,000 tons in 1932. The consumption of bleached sulphite increased from 750,000 tons in 1922 to a peak of 1,200,000 tons in 1930 and decreasing to 1,000,000 tons in 1932. This large increase in consumption of bleached sulphite is probably attributable to its constantly increasing use in the production of rayon and transparent wrapping material.

The consumption of unbleached kraft in this country has increased from 520,000 tons in 1922 to 1,256,000 in 1932. The quantity of bleached kraft has been small—42,000 tons in 1922 and 70,000 in 1932. This extensive use of unbleached kraft has come from several sources. One of these sources has been its substitution for unbleached sulphite in bags, and wrapping papers. The distinctive brown color of the kraft is not as pleasing as that of the whiter unbleached sulphite, but its superior strength overcomes this for many applications. Another source has been the substitution of unbleached kraft for fabric in bags for packaging cement, lime, plaster, and the like. In these cases the dark color has not been objectionable and the high strength has made its use preferable.

During 1934, a movement started toward the production of bleached kraft for use for bags and wrapping paper employed in grocery and meat stores. This trend will not bring about an increased demand for kraft but it will increase the consumption of chlorine. Furthermore, the bleached kraft will be substituted for unbleached sulphite, in spite of its lesser strength. Bleached kraft will also find a use as a substitute for textiles in sugar, flour and meal sacks where the unbleached was not satisfactory. These new uses should, during the next three years, increase the quantity of bleached kraft produced in the United States by at least 200,000 tons per year, which will create an additional demand for approximately 20,000 tons of chlorine per year, 55 tons daily.

Bleaching must still be called an art, for, in spite of developments, comparatively little is known of the exact chemistry involved. Extraction of a large part of the coloring matter by chlorination in chlorine water followed by bleaching to the desired shade of white with a hypochlorite, came into commercial usage some six or eight years ago. This procedure saved 25 to 40 per cent in the total chlorine consumption. However a difficulty was experienced in the highly corrosive action of chlorine water necessitating acid-proof equipment throughout. The stock washers used after chlorination could not be made acid

Kraft and Sulphite Pulp Production and Consumption in the United States

	Kraft				Sulphite			
	Unbleached		Bleached		Unbleached		Bleached	
Year	Production Tons	Consumption Tons	Production Tons	Consumption Tons	Production Tons	Consumption Tons	Production Tons	Consumption Tons
1922	200,000	520,000	20,000	42,000	800,000	1,280,000	500,000	750,000
1923	280,000	530,000	29,000	47,000	850,000	1,390,000	550,000	825,000
1924	280,000	590,000	24,000	53,000	810,000	1,380,000	500,000	800,000
1925	380,000	710,000	31,000	51,000	790,000	1,430,000	600,000	925,000
1926	490,000	870,000	25,000	48,000	900,000	1,610,000	645,000	980,000
1927	560,000	950,000	36,000	48,000	875,000	1,530,000	680,000	1,010,000
1928	725,000	1,170,000	40,000	57,000	840,000	1,530,000	710,000	1,070,000
1929	850,000	1,280,000	67,000	84,000	840,000	1,580,000	830,000	1,200,000
1930	880,000	1,290,000	68,000	88,000	805,000	1,495,000	750,000	1,100,000
1931	980,000	1,350,000	55,000	87,000	680,000	1,270,000	725,000	1,085,000
1932	910,000	1,256,000	40,000	70,000	530,000	1,100,000	670,000	1,000,000

proof, but acidity was neutralized and the stock was made alkaline after chlorination. This procedure protected the washers. The chlorine-lignin products formed in this chlorination stage are not very soluble in an acid medium but they are highly soluble in an alkaline medium, which is the principal reason for the alkaline treatment.

Later a process was developed in which hypochlorous acid was substituted for chlorine water in the first stage. The pH of hypochlorous acid is about 6.8 which makes acid-proof equipment unnecessary and saves the cost of the alkali formerly used after chlorination, thus reducing both installation and operating costs.

Quite recently acid-proof washers have been put on the market which are said to eliminate the need for alkali after the first stage. But their ability to stand up over extended periods has not been demonstrated yet, and their use without alkali means the discharge of acid wastes with the associated stream pollution problem. Furthermore, the alkalizing of pulp at the time of the final washing appears essential, because of the higher solubility of chloro-lignins in alkali medium.

The chlorine economy arising out of "solvent" two stage bleaching is important on all grades of pulp, but especially so on kraft. For example, a 40 per cent saving on 300 lb. of chlorine per ton—a usual single demand for kraft—is more important than a 40 per cent saving on 100 lb. of chlorine per ton—a usual single stage demand for sulphite.

Most of the kraft producers are inexperienced in bleaching and do not understand that the production of a satisfactory bleached pulp starts in the wood room and carries through all departments. Shives, which would never have been seen in an unbleached kraft sheet, show up like the proverbial "sore thumb" in a bleached sheet. This means more and better screens for bleached stock.

Furthermore, a greater economy in chlorine can be gained by changing the cooking procedure. The writer's experience indicates that kraft is rather easily and definitely injured by exposure to acid, whereas sulphite is not. For this reason it is believed that the use of hypochlorous acid in the first stage is distinctly the safe and economical procedure for kraft, reducing as it does, installation and operating expense, and employing only such chemical engineering equipment as has proved practical in other operations.

CITY GAS

Editorial Staff Review

THE public utility gas industry of the United States during 1934 served more customers, sold more gas, took in more revenue than in the preceding year. However, this improvement has not yet restored either the manufactured-gas or natural-gas divisions quite to the peak activity of 1930. Customers are still fewer by about 4 per cent, sales by about 10 per cent, and revenue about 13 per cent in the case of manufactured gas as compared with the record activities of that year.

At present the combined divisions of the industry serve roughly 80 million people, the vast majority of whom have a far more friendly feeling for the industry than their electric contemporaries. Strangely enough, all the agitation against public utility holding companies seems to spend itself in the electrical field, and only that inherent in all public utility relations remains to trouble the gas man as he deals with his customers.

An outstanding development in gas sales during the year was noted in industrial and commercial demands, which increased by approximately 15 per cent in the case of both natural gas and manufactured gas. The house heating division of the manufactured-gas industry also had a notable increase; measured in percentage this was nearly 50 per cent above the preceding year, but of course measured in volume of gas was not so notable as compared with the entire send-out. It is significant, however, that house heating sales of manufactured gas are now nearly 10 per cent of the total send-out. This, and the large increase in sales of high price gas ranges experienced last year, shows that the modernization trend of the day has very definite advantages for the gas man.

Preliminary Estimates for City Gas Industry in 1934

(Data From American Gas Association)

Manufactured Gas	1934	1933	Per Cent Change
Customers...	10,000,000	9,800,000	+ 1.9
Gas Sales (billion cu.ft.)	363	339	+ 6.9
Revenue.....	$382,000,000	$377,888,000	+ 1.1
Natural Gas			
Customers...	5,700,000	5,500,000	+ 3.6
Gas Sales (billion cu. ft.)	934	818	+ 14.1
Revenue.....	$316,000,000	$302,026,000	+ 4.6

MOST RECENT CENSUS DATA

Chloride, pounds......	45,997,960	22,795,699
Value..........	$664,983	$325,399
Sulphur-lime (solution), gallons..........	6,333,822	10,156,917
Value..........	$797,650	$1,173,814
Tin		
Chloride, stannic, pounds	18,888,348	34,871,533
Value..........	$3,228,402	$5,743,308
Chloride, stannous pounds..........	301,840	186,464
Value..........	$98,545	$43,186
Oxide, pounds..........	2,743,179	3,330,156
Value..........	$1,117,545	$911,682
***Vanillin**		
Pounds..........	86,750	128,359
Value..........	$344,000	$590,358
Vitreous enamels ("frit")[8]		
Pounds..........	39,852,992	42,423,773
Value..........	$2,586,714	$3,409,281
Zinc		
Stearate		
Pounds..........	474,422	595,168
Value..........	$94,019	$117,688
Other compounds, excluding pigment oxide, value..........	$3,754,408	$2,344,824
Other inorganic chemicals (of lithium, molybdenum, phosphorus, silicon, titanium, uranium, vanadium, etc.), miscellaneous metals (of aluminum, sodium, magnesium, phosphorus, tungsten, zirconium, etc.), and calcined bauxite, value.......	$33,080,665	$62,272,286
Other organic chemicals (ethylene bromide, ethylene glycol, formaldehyde, hexamethylene-tetramine, methyl chloride, tetraethyl lead, etc.), value..........	$34,365,143	$41,075,129

*Organic. [1]Included in report for liquors, distilled, and ethyl alcohol. [2]No data. [3]Included in value of "Other organic chemicals." [4]Production for sale by chemical and soap manufacturing establishments only. The total production of crude glycerin, 80 per cent basis, was as follows: 1933, 119,811,648 lb.; 1931, 140,001,604 lb. [5]Included in value of "Other inorganic chemicals." [6]Production, for sale, of electric-furnace ferro-alloys only. For total production, see report on Ferro-alloys. [7]Not including photographic films. [8]Production for sale only. In addition, vitreous enamels were made and consumed in further manufacturing operations in the "Stamped Ware, Enameled Ware, and Metal Stampings; Enameling; Japanning, and Lacquering," and "Plumbers' Supplies, Not Including Pipe or Vitreous-China Sanitary Ware" industries, as follows: 1933, 32,538,132 lb., valued at $1,567,644; 1931, 52,528,344 lb., valued at $2,931,598.

COMPRESSED AND LIQUEFIED GASES

(All figures refer to production for sale, except otherwise noted.)

	1933	1931
Compressed and liquefied gases		
Aggregate value.......	$47,097,413	$56,705,276
Made in the Compressed and Liquefied Gases industry, value	$31,725,925	$41,470,825
Made as secondary products in other industries, value..........	$15,371,488	$15,234,451
Ammonia, anhydrous[1]		
Pounds..........	160,193,292	127,098,718
Value..........	$7,516,279	$8,043,679
Carbon dioxide (excluding "dry ice")		
Pounds[2]..........	114,861,428	153,574,997
Value..........	$4,463,857	$6,225,643
"Dry ice" (solid carbon dioxide)		
Pounds..........	59,578,428	84,954,018
Value..........	$1,972,130	$2,899,738
Chlorine		
Total production, pounds..........	428,177,606	361,739,705
Consumed where made, pounds..........	179,052,101	106,229,018
For sale, pounds	249,125,505	255,510,687
Value..........	$4,486,325	$5,248,496
Acetylene		
M cubic feet..........	734,089	742,898
Value..........	$11,038,959	$12,911,727
Hydrocarbon gases other than acetylene, value..........	$1,216,859	$1,627,183

MOST RECENT CENSUS DATA

GASES, Contd.

Hydrogen		
M cubic feet	589,290	493,518
Value	$914,532	$957,373
Oxygen		
Total production, M cu. ft.	1,804,864	2,050,377
Liquefaction process	1,739,945	1,997,810
Electrolytic process	64,919	52,567
Value	$12,842,056	$16,410,759
Nitrous oxide		
Thousands of gallons	82,220	94,607
Value	$810,529	$922,626
Sulphur dioxide		
Pounds	32,233,779	16,104,534
Value	$1,052,226	$839,021
Other gases, value	$783,661	$619,031

[1]Not including production in Coke and Manufactured-Gas industries. [2]Includes, for 1933, approximately 64,500,000 lb. of carbon dioxide piped to plants making "dry ice"; for 1931, approximately 80,000,000 lb.

DISTILLED LIQUORS AND ETHYL ALCOHOL

(All figures refer to production for sale, except as otherwise noted.)

	1933
Distilled spirits, total proof gals	160,791,753
Whiskey	18,864,715
Brandy	1,404,378
Gin	867,415
Rum	1,465,312
Alcohol	138,189,933

TANNING MATERIALS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Tanning materials, natural dyestuffs, mordants, assistants, and sizes, aggregate value	$20,636,430	$22,994,457
Made in the Tanning Materials industry	$18,770,319	$21,435,171
Made as secondary products in other industries	$1,866,111	$1,559,286
Tanning materials[1], total value	$7,062,861	$8,092,833

TURPENTINE AND ROSIN

	1933	1931
Turpentine		
From crude gum, gals	25,500,000	
From wood distillation, gals	3,652,200	3,150,490
Rosin		
From crude gum, tons	425,000	
From wood distillation, tons	112,253	83,378
Extracts		
Chestnut, pounds (liquid and solid)	250,413,419	229,276,138
Value	$3,616,974	$3,643,611
Oak, pounds (liquid and solid)	4,949,547	4,505,145
Value	$124,164	$138,694
Quebracho, pounds (liquid and solid)	33,708,859	75,747,460
Value	$763,366	$1,834,167
Myrobalans, pounds	788,069	2,265,579
Value	$25,416	$66,316
Sumac, pounds (liquid)	6,452,367	5,809,278
Value	$301,255	$369,716
Other extracts, value	$503,090	$279,292
Other tanning materials, value	$1,728,596	$1,761,037
Natural dyestuffs, total	$1,133,453	$1,615,679
Logwood extract		
Pounds (liquid and solid)	10,826,678	17,029,808
Value	$870,393	$1,250,283
Quercitron extract		
Pounds (liquid and solid)	1,453,417	1,437,530
Value	$68,137	$63,156
Other extracts and ground, chipped and dry product, value	$194,923	$302,240
Mordants, total value	$458,612	$449,276
Tannic acid		
Pounds	684,462	667,212
Value	$236,125	$250,874
Other, value	$222,487	$198,402
Assistants, total value	$5,922,792	$5,186,556
Turkey-red oil, quantity reported, pounds	17,572,645	12,998,934
Value	$1,726,061	$1,238,371
Quantity not reported, value	$112,865	[2]
Softeners, quantity reported, pounds	21,189,657	26,526,210

BETTER SERVICE FOR

FERTILIZER NITROGEN

By Chaplin Tyler
*Ammonia Department,
E. I. du Pont de Nemours & Co., Inc.,
Wilmington, Del.*

PRODUCERS of fertilizer nitrogen comprise the following groups: (1.) Domestic synthetic nitrogen (anhydrous ammonia, ammonia liquor, urea-ammonia liquor, crude nitrogen solution, nitrate of soda, ammophos, sulphate of ammonia). (2.) Domestic byproduct nitrogen (sulphate of ammonia, ammonia liquor). (3.) Domestic byproduct organic nitrogen (cottonseed meal, tankage, fish meal, blood). (4.) Foreign synthetic nitrogen (sulphate of ammonia, cyanamid, Cal-Nitro, calcium nitrate, urea), and (5.) Foreign natural nitrogen (Chilean nitrate, guano). Although the ultimate consumer of fertilizer nitrogen is the farmer, the consumer groups from the viewpoint of nitrogen producers are, first the fertilizer manufacturers (wet and dry mixers) and, second, the farmer co-operatives.

This brief article deals principally with the relationship between domestic producers of synthetic nitrogen and the consumer as represented by fertilizer manufacturers who conduct the integrated operations of wet mixing, dry mixing, and distribution.

While the ammonia synthesis in this country was developed originally to meet demands for "technical" nitrogen, as for example anhydrous ammonia for refrigeration and for nitric acid, it was appreciated that fertilizer nitrogen constituted the largest potential outlet. How best to serve the fertilizer industry has been given much attention, particularly during the past seven years. One possibility, now achieved, was to produce such nitrogen carriers as nitrate of soda and sulphate of ammonia, long recognized as fertilizer "staples."

Another possibility was to produce nitrogen carriers which would have desirable properties not possessed by the older staples. To this end, a good start has been made by the way of such "ammoniating" agents as anhydrous ammonia, Urea-Ammonia Liquor, and Crude Nitrogen Solution. Merely to produce these materials was not sufficient, however. It was necessary also to work out a technique of handling and mixing simply enough and cheaply enough to be applied generally by the consumer.

The starting point for such a program was recognition by the nitrogen producer that the fertilizer industry is founded on superphosphate and that superphosphate is a material of unquestioned merit as proved by experience of nearly 80 years. Also, it was recognized that there was a demand for mixed fertilizers having more plant food, better handling properties, and less potential acidity. Finally it was desirable that costs be reduced, certainly not increased.

In order to carry out this program, the nitrogen producer developed formulae and mixing technique and demonstrated these in the fertilizer mill. (Field tests were initiated in order to make sure that the product was "right.") Trained service men were put at the disposal of the consumer. Engineering designs and recommendations for the necessary equipment were made available. The underlying chemistry was studied and the results published in leading journals.

To this "consumer research" the fertilizer industry responded immediately. Today "ammoniation" is a widespread commercial practice which has brought increased sales to the nitrogen producer and an improved product to the consumer. And probably it is not an exaggeration to say that whereas a few years ago there was much propaganda made for radically different forms of phosphatic fertilizers, it is now evident that super-phosphate, ammoniated and combined with other carriers, including some limestone, constitutes a product that will withstand many more years of competition. In a word, superphosphate, believed by many observers to be "on the way out" has been given a decided new lease on life through the activities of the producers of fertilizer nitrogen.

FERRIC SULPHATE

By F. J. Curtis
*Director of Development,
Merrimac Chemical Co.,
Boston, Mass.*

ALTHOUGH ferric sulphate is a commonplace reagent in the laboratory, its advent as a cheap heavy chemical did not take place until within the last two years. As is often the case with a new industrial product, the specifications have not yet crystallized and several grades and strengths are on the market.

Ferric sulphate is finding its chief uses in the purification of water and as a coagulant for sewage. It has the advantage common to many ferric salts of coagulating on the alkaline side where aluminum sulphate forms soluble compounds. The whole tendency in water purification in late years has been to get away from acid or neutral

water and its resulting corrosion. This has been held up by the inherent natural disadvantages of the chief coagulant, aluminum sulphate.

Likewise the treatment of sewage by bacterial methods has necessitated huge capital expenditures for plant and this whole development has thus been hindered. Yet as the country grows more and more densely settled, such treatment becomes more and more necessary. The advent of a cheap iron coagulant has stimulated the development of chemical sewage treatment in small plants which can be more readily built and constructed by smaller communities.

Minor uses for ferric sulphate are for the sizing of paper, refining of benzol and petroleum, and in the oxidation of dyestuffs. Thus the entrance of a new and cheap industrial chemical improves relations between producer and consumer by enabling the latter to better and cheapen processes essential to modern civilization.

FURFURAL

By F. N. Peters
Furfural Division
The Quaker Oats Co.
Chicago, Ill.

IN MANY INDUSTRIES the consumer-producer relationships may be divided into those dealing with the large user and those concerned with the demands of the small customer. In the specific case of furfural it has been found much easier to be of service to the large consumer because he has not only been willing to furnish us information regarding his problems but has frequently allowed us full access to his plants and to the details of his operating processes. There have been few if any secrets between the large customer and the furfural manufacturer, in so far as the use of the products is concerned. On the other hand, many of the smaller consumers guard their use of furfural with the greatest secrecy and sometimes it is only after years of supplying them with material that we have even a small knowledge of the use to which it is being put.

If the small customer would realize that the manufacturer really desires to be of service and is no pirate in search of secrets and could be persuaded to take the manufacturer into his confidence, the latter would really be able to cooperate with the consumer to their mutual benefit. We have in mind the extreme case of one who purchased experimental lots of furfural for two years. All attempts to learn the nature of the experiments failed. At the end of that time the experiments were given up as failures and the nature of the research divulged. The problem had been solved years before in our laboratory and the answer could have been had for the asking.

In the past few years, however, there has been one improvement in consumer-producer relationships which has applied to both large and small customers alike. This is the realization that while furfural is a by-product of a large industry, it is manufactured from a material which has a very definite market value; therefore the price of furfural cannot be expected to go below certain rather closely defined limits. In former years the feeling was quite general that in case the volume of furfural sales became very large its price could almost approach zero. By processes of education and the definite realization of the true facts surrounding the production of furfural, it has come to be generally appreciated that the price of this product is being held as stable as possible and that it will be lowered as fast as conditions warrant. This change in attitude has allowed the customer to take his mind from the problem of price and permitted him to devote his energies to a study of performance.

No projects warranting the name of cooperative research between producer and consumer have been carried to completion, although our staff has on occasion closely examined the processes of some of our customers. And because of our intimate knowledge of the details connected with the chemistry of the furans we have on several occasions been able to suggest alterations or changes which have resulted in considerable saving to the users of furfural.

From time to time individuals and corporations have considered the manufacture of furfural but have never gone beyond the stage of merely thinking about it. This is probably because the price of furfural has been reduced to a point where it can be made at a profit only from a comparatively cheap raw material available in tremendous quantities. The capital investment required is very considerable and the markets are not large enough to warrant the advent of another producer. There is little doubt but that as the demands for furfural increase, sooner or later someone will enter the field besides the Quaker Oats Co. The companies most frequently concerned with this projected manufacture are

MOST RECENT CENSUS DATA

Value	$1,086,502	$1,638,665
Quantity not reported, value	$235,925	[2]
Other, value	$2,761,439	$2,309,520
Sizes, total value	$6,058,712	$7,650,113
Dextrin sizes, pounds	24,173,571	25,105,528
Value	$1,448,015	$1,443,655
Other sizes, quantity reported, pounds	162,166,227	190,771,515
Value	$4,426,195	$6,206,458
Quantity not reported, value	$184,502	[2]

[1]Not including tanning materials made and consumed in the same establishments. [2]No data.

CERAMICS, BRICK, AND CLAY PRODUCTS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Clay products (other than pottery) and nonclay refractories, total value	$64,017,331	$127,467,979
Made in the "Clay products (other than pottery) and nonclay refractories" industry	$63,435,646	$125,824,674
Made as secondary products in other industries	$87,864	$1,273,848
Made by establishments reporting products valued at less than $5,000[1]	$493,821	$369,457
Common brick		
Thousands	1,009,430	2,314,664
Value	$8,731,320	$21,652,130
Vitrified brick or block		
For paving, thousands	53,814	178,693
Value	$1,106,043	$3,844,575
Other vitrified brick or block, thousands	9,297	28,693
Value	$118,289	$421,831
Face brick		
Thousands	269,946	903,226
Value	$3,801,434	$13,271,068
Enameled brick		
Thousands	4,292	8,605
Value	$171,832	$484,339
Hollow brick		
Thousands	4,309	6,175
Value	$79,607	$58,266
Terra cotta		
Tons	23,317	54,706
Value	$1,664,060	$5,491,609
Hollow building tile		
Partition, load-bearing, furring, and book tile, tons	525,988	1,646,254
Value	$2,399,023	$8,774,441
Conduit, tons	11,981	121,423
Value	$141,336	$1,628,028
Floor-arch, silo, and corncrib tile; radial chimney blocks; fireproofing tile, tons	68,673	159,981
Value	$290,793	$769,337
Roofing tile		
Production, squares	103,257	285,253
Value	$910,647	$3,125,175
Floor tile (plain, vitreous, encaustic, quarry, etc.), sq. ft	5,300,063	12,180,913
Value	$657,540	$2,051,826
Ceramic mosaic tile (vitreous and semi-vitreous, unglazed), sq. ft	4,228,739	8,743,806
Value	$698,945	$1,780,795
Enameled tile (bright, dull, matt, and semi-matt finishes) and glazed ceramic mosaic, sq. ft	7,252,130	19,430,354
Value	$2,060,150	$6,482,910
Faience tile (incl. hand-decorated), sq. ft	1,128,413	2,000,878
Value	$310,391	$1,266,086
Wall tile (white and bright-glazed), incl. trim, sq. ft	9,929,807	17,716,046
Value	$1,551,634	$4,992,817
Drain tile		
Tons	167,380	253,308
Value	$1,122,744	$1,666,970
Sewer pipe		
Tons	429,095	823,303
Value	$4,716,343	$9,448,473
Stove lining		
Tons	5,827	8,877
Value	$224,371	$316,600

MOST RECENT CENSUS DATA

CERAMICS, Contd.

Flue lining		
Tons	45,437	85,718
Value	$471,155	$838,985
Chimney pipe and tops		
Tons	5,258	4,151
Value	$57,151	$134,127
Wall coping		
Tons	7,612	13,098
Value	$80,442	$148,654
Fire-clay products		
Brick, block, or tile for locomotive and other fire-box lining, etc. (9-in. equiv.) M	435,631	416,041
Value	$13,055,936	$15,685,507
High-alumina brick (over 40% Al_2O_3) M	8,278	7,020
Value	$667,365	$733,579
Special shapes		
Tons	106,907	126,811
Value	$2,293,351	$3,068,302
Glass-house tank blocks, melting pots, stoppers, floaters, and rings, tons	22,065	22,853
Value	$1,757,118	$1,258,546
Refractory cement (clay)		
Tons	26,375	38,578
Value	$1,056,593	$1,349,922
Clay sold, raw or prepared		
Tons	192,138	214,168
Value	$1,012,206	$970,421
Other clay products, value	$739,995	$1,584,548
Silica brick		
Thousands	110,889	103,557
Value	$4,654,776	$5,131,514
Magnesite and chrome brick, thousands	9,027	8,365
Value	$2,579,994	$2,233,810
Crucibles, graphite, value	$757,996	$1,113,972
Refractory cement (nonclay)		
Tons	42,099	35,641
Value	$1,130,409	$920,067
Other nonclay refractories, incl. those of alumina and silicon carbide, value	$2,946,342	$4,768,749

[1] The canvass for the biennial census of manufactures is confined, for the most part, to establishments with a yearly output valued at $5,000 or more, but it has been found desirable in the case of the clay-products industries to collect data on production from all establishments without regard to size of output.

Pottery, total value	$43,917,071	$66,582,501
Made in the pottery industry	$43,332,264	$65,241,263
Made as secondary products in other industries	$458,611	$1,301,258
Made by establishments reporting products valued at less than $5,000[1]	$126,196	$39,980
Red earthenware, value	$1,207,396	$2,034,299
Stoneware (except chemical), value	$2,058,984	$3,085,557
Yellow and Rockingham ware, value	$156,060	$213,713
Chemical stoneware, value	$383,067	$661,639
Chemical porcelain, value	$316,845	$307,661
White ware, including cream-color, white granite, semiporcelain, and semivitreous porcelain ware, value	$15,005,178	$20,108,359
Hotel china, value	$5,007,669	$6,594,495
Vitreous-china plumbing fixtures (exclusive of fittings), total value	$7,707,938	$12,894,277
Bathroom and toilet fixtures	$7,207,081	$12,261,995
Other vitreous-china fixtures, value	$500,857	$632,282
Semivitreous or porcelain (all-clay) plumbing fixtures (excl. of fittings), value	$646,705	$1,995,179
Laundry tubs and kitchen sinks, pieces	19,014	54,920
Value	$178,132	$453,001
Other semivitreous fixtures, value	$468,573	$1,542,178
Porcelain electrical supplies (excl. of fittings), value	$7,050,734	$13,154,077

BETTER SERVICE FOR

those interested in the utilization of agricultural wastes. While the project may at first sight appear attractive, close examination of the equipment necessary, the capital outlay involved, and the potential markets for furfural, alcohol, acetic acid, or such other chemicals as might be produced from agricultural wastes, causes the whole proposition to look most uninviting to the well informed chemical executive or engineer.

INSECTICIDES

By Charles P. McCormick
President,
National Association of Insecticide and Disinfectant Manufacturers,
Baltimore, Md.

DURING the past year the National Association of Insecticide and Disinfectant Manufacturers has endeavored to produce a workable code under N.R.A. and while the results may not be altogether satisfactory to everyone, it is nevertheless a definite starting point for the industry in its program of self regulation. In comparison with some others this industry has much to be thankful for and prospects for 1935 appear brighter than at any time during the last four years.

The Association will endeavor to strengthen its service to both producer and customer during the coming year. It is anticipated that many helpful policies will be fostered including more publicity, more research and more sales. The officers and directors fully realize the seriousness of their task to create and initiate new thoughts and plans for the membership, and believe that such a program will result in better profits and sales. This business is righting itself and more earnest thought is being given towards "unselfish selfish" motives. People are more optimistic and the trade looks with more hope toward better times.

INDUSTRIAL ALCOHOL

Editorial Staff Review

INDUSTRIAL alcohol production in 1934 was decidedly higher than in the preceding year. Full returns on the anti-freeze sales are not yet available but it appears that between 10 and 15 per cent greater sales of denatured alcohol occurred in 1934 than during the preceding twelve months. The year also saw numerous other developments of interest to both users and producers.

The repeal of prohibition did not affect the industrial alcohol industry as such. Title III of the National Prohibition Act covering the manufacture, distribution and use of nonbeverage industrial alcohol remains in full force and effect and serves to draw a definite line of demarcation between industrial and non-industrial alcohol.

Further development of synthetic alcohol manufacture is anticipated as the desire continues to use more efficiently oil-refinery still gases. This source of raw material makes the market price of alcohol independent of molasses or grain prices. Thus the stabilizing influence on price which has come about through synthetic manufacture has in large measure benefited producers of fermentation alcohol as well as ensured a ceiling price for consumers.

Even the Maine potato growers now propose to utilize their surplus in the manufacture of both beverage and industrial alcohol. Lately they have been seeking government aid in this project to the extent of money as well as permits.

Use of industrial alcohol for motor fuel blending was again frequently proposed by self-appointed spokesmen of agriculture. These Mid-West farm leaders have carried out experiments on a substantial scale which again demonstrated in practice the correctness of long-established engineering knowledge. Alcohol can, it is now proved commercially, be mixed with gasoline and successfully used in motor cars. The speed of development in this direction is, therefore, wholly a matter of relative cost. With gasoline selling at the refinery at 5 or 6 cents per gallon, or occasionally lower, the chance for alcohol to develop is nil unless artificial subsidy is offered. The lowest cost for alcohol from any responsible source noted is approximately 12 cents per gallon and so low a cost as this must assume either cheap corn or a higher return for byproducts such as corn oil and press cake than is reasonable to assume.

Competition by other commodities has been very aggressive in the anti-freeze market this season. Although there has been practically no glycerine available for that purpose, ethylene glycol, even though much higher in price than denatured alcohol, has developed a large market while straight methanol, in the same price field as

denatured alcohol, has also found a larger distribution in the anti-freeze field.

The tentatively authorized and then withdrawn methanol denaturant formula for alcohol remains in the pigeonhole at the Treasury Department. It is evident that the Secretary feels that there is some public hazard involved in selling alcohol denatured with methanol. Under the circumstances, it remains uncertain how soon he can be persuaded to permit marketing of this desired formula, of course with proper restrictions and labeling. Both the alcohol and methanol industries are continuing to press the matter and hope for an authorization during the coming Spring.

The industrial alcohol industry is confronted with the problem of State laws intended to regulate the liquor traffic, which at the same time affect industrial alcohol. The Industrial Alcohol Institute is keeping in close touch with the situation in the forty states whose legislatures meet during January and will attempt to prevent any liquor legislation that will in any way hamper the normal and legitimate sale and use of industrial nonbeverage alcohol.

Intense competition for volume during the first half of 1934 resulted in prices that were in some instances below the cost of production but the knowledge of higher manufacturing costs for 1935, that became evident by the mid-year, caused a strengthening of the price structure toward the end of 1934.

A Code of Fair Trade Practices for the industry became effective on November 8, 1934, and its provisions have tended to put an end to the numerous unfair and unethical practices that had been prevalent and which had been mainly responsible in the past for chaotic conditions in the industry. As a result, the industry is looking for better and more stable business in 1935.

LIME

By Norman G. Hough
President and General Manager, National Lime Association, Washington, D. C.

WHILE much progress has been made by the lime industry in developing consumer-producer relationships of mutual benefit, we recognize that more work in this direction should be done. However, we feel that the citation of a few facts concerning the extraordinary problems involved will not be amiss since the industry, in large measure, cannot progress greatly toward solving these problems without the cooperation of the consumer.

Lime is one of the oldest chemicals known to man, yet its properties, particularly those of a physical nature, are not thoroughly understood. The reason for this may be better appreciated if consideration is given to the source of the raw material, to the manufacturing process, and to the numerous uses which this material serves.

The physical properties of the finished product are closely related to the nature of the raw material. The raw material is limestone. From Maine to Florida and from the Atlantic to the Pacific, the country is dotted with lime plants utilizing deposits of stone ranging from crystalline marble to amorphous chalk. Some of these plants are highly mechanized and others are hand operated. Practically every type of fuel that can be mentioned—wood, coal, producer gas, natural gas, oil—is used by the industry. There are no restrictions as to the type of product produced except those laid down by the consumer. The properties of lime from a given deposit of stone burned under a given set of conditions are generally uniform, but the properties of lime from different sources vary widely.

The manufacturing process, and the degree to which the product is refined, is largely dependent upon the requirements of the consumer and the price which he is willing to pay.

Lime is used as a raw material in a great many industries, wherein it serves a multiplicity of purposes. Such broad use as a chemical reagent depends upon the fact that lime from different sources has widely varying chemical and physical properties. The diversity of its properties permits of its use in such contradictory roles as a lubricant in the wire drawing process and as an abrasive in the polishing of metals. It is required to be rapid settling for causticization processes and slow settling for use in the absorption of gases. In the purification and softening of our water supplies, in the treatment of sewage and trade wastes, in the refining of petroleum, and in the manufacture of grease, lime plays an important part. To understand all of the requirements for lime one would need be an expert in an endless number of industrial processes

MOST RECENT CENSUS DATA

Insulators	$1,972,456	$6,283,577
Other electrical supplies	$5,078,278	$6,870,500
Garden pottery, value	$176,396	$308,363
Art pottery, value	$1,484,572	$1,614,543
Saggers, value	$326,444	$645,086
Other pottery products, value	$2,389,083	$2,965,253

[1]The canvass for the biennial census of manufactures is confined, for the most part, to establishments with a yearly output valued at $5,000 or more, but it has been found desirable in the case of the pottery industry to collect data on production from all establishments without regard to size of output.

Sand-lime brick[1]	$205,129	$1,267,538
Thousands	22,904	143,673
Value	$195,318	$1,236,825
Other products, value	$9,811	$30,713

[1]Manufacturers' profits or losses can not be calculated from the census figures, because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance, and advertising

EXPLOSIVES

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Explosives (including consumption in shooting wells), total		
Pounds	288,407,846	350,913,678
Value	$29,045,482	$40,269,344
Dynamite		
Pounds	147,844,610	191,843,064
Value	$15,222,725	$22,023,737
Permissible explosives		
Pounds	51,560,267	51,578,885
Value	$4,153,927	$5,820,489
Nitroglycerin		
Consumed in shooting wells, pounds / For sale as such, pounds	[1]1,111,011	678,916
Amount received for shooting wells on contract / For sale as such, value	[1]$450,970	$433,851
Blasting powder		
Kegs (25 lb.)	2,647,525	3,137,389
Value	$4,056,386	$4,909,226
Fuse powder		
Pounds	992,439	1,421,895
Value	$186,092	$292,964
Other explosives, including gunpowder (black and smokeless)[1]		
Pounds	20,711,394	26,956,195
Value	$4,975,382	$6,789,077

[1]Figures combined to avoid disclosing approximations of data for individual establishments.

FERTILIZERS

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Total tons	5,149,293	6,813,801
Total value	$81,909,587	$137,159,275
Made in the fertilizers industry, value	$76,743,916	$131,659,564
Made as secondary products in other industries, value	$5,165,671	$5,499,711
Complete fertilizers		
Tons	3,262,692	4,461,270
Value	$61,061,800	$107,981,716
Superphosphates, incl. concentrated phosphates[1]		
Tons	1,534,022	1,963,503
Value	$12,796,026	$20,638,816
Fish scrap		
Tons	44,817	37,703
Value	$1,322,197	$1,168,062
Potash superphosphate		
Tons	86,868	144,867
Value	$1,385,040	$2,914,269
Bone meal		
Tons	9,429	18,148
Value	$252,182	$675,690
Other fertilizers		
Tons	211,465	188,310
Value	$5,092,342	$3,780,722

[1]Basis 16 per cent available phosphoric acid.

GLASS AND GLASSWARE

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Total value	$184,509,109	$211,955,360

MOST RECENT CENSUS DATA

GLASS, Contd.

Polished plate glass		
Square feet	[1]	87,017,237
Value	[1]	$25,765,129
Window glass		
Square feet	249,441,799	266,772,159
Value	$10,455,883	$10,307,396
Obscured glass, incl. cathedral and skylight glass, and opalescent sheet glass		
Square feet	[2]19,858,490	17,796,456
Value		$2,388,939
Wire glass, rough and polished	[2]$2,590,980	
Square feet		15,663,837
Value		$1,800,406
Pressed and blown glass (except containers)		
Tableware and ovenware, value[3]	$10,816,356	$13,764,295
Pressed tumblers and goblets, dozens	11,251,748	8,333,679
Value	$4,272,266	$2,689,207
Blown tumblers, stem ware, and bar goods, value	$10,317,929	$7,809,897
Lenses, value	700,003	$1,361,869
Lamps, value	$439,425	$542,307
Lamp chimneys, dozens	1,875,829	1,597,144
Value	$989,606	$1,100,251
Lantern globes, dozens	281,070	403,759
Value	$230,289	$382,904
Shades, globes, and other gas and electric goods (except electric bulbs and insulators), value	$3,579,631	$6,590,032
Tubing, pounds	14,269,954	17,291,889
Value	$2,575,281	$3,140,005
Insulators, value	[1]	$806,744
Opal ware, other than containers, dozens	[1]	180,985
Value	[1]	$494,727
Bulbs for electric lamps, specialties, and other pressed and blown glass products, value	$11,059,719	$17,830,327
Glass containers		
Milk bottles, gross	1,960,215	2,135,692
Value	$9,181,039	$10,027,315
Blown packers' ware, narrow-neck and wide-mouth, gross	9,354,565	8,975,653
Value	$25,462,081	$25,798,540
Pressed packers' ware, gross	....	822,395
Value	....	$1,861,760
Fruit jars (home-pack)	[2]1,540,407	....
Gross	[2]$9,369,377	2,082,185
Value	....	$15,103,062
Beverage containers, pressure ware, gross	6,061,035	3,537,799
Value	$20,069,246	$13,096,958
Nonpressure ware, gross	466,513	577,411
Value	$1,499,740	$2,544,970
Medicinal and toilet-preparation containers (pressed and blown), gross	14,120,170	12,765,353
Value	$29,783,741	$30,280,297
General-purpose containers, gross	1,323,382	1,028,709
Value	$3,996,520	$6,615,310
Other glass products, value	$27,119,997	$9,852,713

[1]Withheld to avoid disclosing approximations of the output of individual establishments; value included in item for "Other glass products." [2]Combined to avoid disclosing approximations of the output of individual establishments. [3]Data for tableware and ovenware combined to avoid disclosing approximations of the output of individual establishments.

LEATHER

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Aggregate value	$216,970,472	$246,269,474
Sole and belting, leather (excluding horse butts), value	$60,551,150	$74,579,226
Oak and union sole, backs, bends, and sides	15,404,324	11,570,493
Value	$38,483,597	$54,292,563
Chrome and combination sole, backs, bends, and sides	559,355	414,279
Value	$1,988,337	$1,996,246
Belting butts, rough and curried, butts and butt bends	673,705	620,960
Value	$5,165,185	$5,542,435

BETTER SERVICE FOR

and at the same time keep abreast of new uses which are developing each year.

In spite of the enormity of this task, the lime industry has taken commendable steps to learn more about the uses of its products. Considerable knowledge as to the properties of lime has been developed in research programs supported by the lime industry in its own laboratories, as well as by sustaining fellowships at the National Bureau of Standards and at leading colleges and universities. Independent investigators have added to the store of knowledge. For a number of years the National Lime Association, supported by an unselfish group of manufacturers, has sought to collect all available information pertaining to the use of lime and to disseminate the knowledge to all.

Consumers of chemical lime have a choice of products at a reasonable cost for a diversity of uses. It is important that the consumer know his requirements and then seek the type of lime best suited for his needs. It may be more economical to pay a higher freight and secure lime from some distant point dependent upon certain well known property requirements. On the other hand, cooperation with a local source of supply based upon an exchange of knowledge as to the process involved and the properties of lime required may result in refinements of the local product to the mutual benefit of consumer and manufacturer.

As one correspondent so aptly stated in the series of discussions that have recently appeared in *Chem. & Met.* (Nov. & Dec., 1934, pp. 598-9 and 652-3), lime is a low-priced material. So long as it can be produced in such abundance it will continue to be such, consequently, any budget for research and development must, of necessity, be limited and this, in turn, limits the work to known problems. Some of the correspondence in your discussion indicates that some consumers do not have a clear conception of just what their problems are in relation to the use of lime. Without this knowledge the producer is certainly at a tremendous disadvantage in serving the lime consumer.

As we view the situation, the real value of your editorial (*Chem. & Met.* Sept., 1934, p. 454) and subsequent correspondence lies in definitely pointing out the necessity for better relationships between the consumer and the producer, a closer and stronger cooperation, so that consumer problems, where they exist, can be worked out intelligently. This unquestionably would clear up many apparent problems which actually may be attributed to inefficient use of the material. With knowledge that a definite problem exists, we are sure lime producers will not be found wanting in the development of a solution

Consumption of Lime by Industries

Data From U S. Bureau of Mines

	1932			1933		
	1,000 Short Tons	Per Cent of All Lime	Per Cent of Chemical Lime	1,000 Short Tons	Per Cent of All Lime	Per Cent of Chemical Lime
Total	1,963	100	...	2,269	100	...
Agricultural	246	12.5	...	246	10.8	...
Building	597	30.4	...	533	23.5	...
Chemical	1,120	57.1	100	1,490	65.7	100
Paper Mills	260	13.2	25.3	305	13.4	20.4
Metallurgy	170	8.7	15.5	266	11.7	17.7
Water Purification	143	7.3	13.0	175	7.7	11.7
Refractory lime (dead-burned dolomite)	136	6.9	12.1	262	11.5	17.6
Glass Works	51	2.6	4.7	83	3.7	5.6
Tanneries	46	2.4	4.2	71	3.1	4.7
Sugar Refineries	23	1.2	2.1	17	.8	1.1
Calcium Carbide	23	1.2	2.1	23	1.0	1.5
Insecticides	22	1.2	2.0	22	1.0	1.5
Coke & Gas Works	17	0.9	1.5	23	1.0	1.5
Oil & Fat Manufacture	17	0.9	1.5	21	.9	1.4
Soap Making	16	0.8	1.4	8	.4	.5
Sand-Lime Brick	14	0.7	1.3	4	.2	.3
Liquid Bleach	12	0.6	1.1	16	.7	1.0
Paint (calcimine, whitewash, varnish, etc.)	10	0.5	0.9	7	.3	.5
Alkali Works	8	0.4	0.7	10	.5	.7
Bleaching Powder	8	0.4	0.7	*	*	*
Food Products	7	0.3	0.6	9	.4	.6
Calcium Acetate and Wood Distillation	5	0.2	0.4	8	.4	.5
Glue	3	0.15	0.25	3	.1	.2
Silica Brick	3	0.15	0.25	9	.4	.6
Rubber	2	0.1	0.2	2	#	.1
Alcohol	2	0.1	0.2	*	*	*
Salt	1.5	#	#	5	.2	.3
Textiles	1	#	#	*	*	*
Acid Neutralization	*	*	*	6	.3	.4
Magnesia Works	*	*	*	5	.2	.3
Tobacco Curing	*	*	*	3	.1	.2
Gelatin	*	*	*	2	#	.1
Polishing & Buffing	*	*	*	1	#	#
Miscellaneous	121	6.0	10.8	125	6.0	8.4

*Data not shown. #Less than 0.1 per cent.

MAGNESIUM COMPOUNDS

By Max Y. Seaton
Vice-President, California Chemical Co., Newark, Calif.

ACTIVITY in the development of magnesium compounds has been largely confined to magnesium oxide and hydroxide. The adsorptive properties of the particular type of oxide reported by Strain (*Jour. Biol. Chem.*, Vol. 105, p. 523) has proved of great interest to investigators both here and abroad and many workers are studying its properties. Products of far higher absorbing powers than that used by Strain are now available commercially.

Magnesium hydroxide is finding an increasing use as a reagent for petroleum treatment, both in the so-called "sweetening process" (see *Chem. & Met.*, July, 1932, pp. 378-9) and in the neutralizing of corrosive crude oils in West Coast operations. A similar development in the mid-continent field is likely. In addition to liquid phase neutralization, magnesium hydroxide has more recently been applied at tower packing for vapor-phase reaction towers.

Refractories continue to be the largest single consumer of magnesium compounds. Brick made from a low-iron and relatively high purity crystalline magnesium oxide or artificial periclase are giving service superior to that observed from a less pure product. Absence of exact knowledge of the quaternary system silica-alumina-lime-magnesia has prevented accurate predictions being made as to the behavior of high magnesium refractories made from commercially available material, but recent determinations of this system's characteristics should correct this difficulty and point the way to further advances in this field.

The year has seen a number of other minor, but potentially important developments. The use of magnesium compounds in fertilizers applied to land deficient in this element, has yielded very satisfactory results both in New England and in certain southern states. Magnesium carbonate finds an increasing application in ceramics with indications that magnesium hydroxide may be even more useful. Continued research on the modification of the properties and composition of all of the insoluble magnesium compounds would seem to point the way to still further expansion of the market for these products as soon as the producers and consumers obtain more exact knowledge of their behavior.

METHANOL

By M. H. Haertel
Secretary, Hardwood Distillation Industry Code Authority, Washington, D. C.

METHANOL survived the vicissitudes of 1934 in a reasonably profitable fashion. It intrenched itself more firmly in the field of low-priced anti-freeze agents used by the motoring public. It maintained its place as a solvent and its value as a reagent in certain chemical processes such as the manufacture of condensation products remained unchallenged.

The year witnessed one development that provided the producer of natural methanol with grim satisfaction. The elimination of wood alcohol from completely denatured alcohol some years ago gave short-lived joy to a few politicians but brought vast confusion to an important branch of the chemical manufacturing industry. The government, in a frantic search for something "just as good," jumped from one formula to another, and eventually arrived at a mixture that because of its unpleasant odor, drove many old-time customers of alcohol to the use of other anti-freeze agents. Producers of denatured alcohol accordingly petitioned the United States Treasury Department for a restoration of the pre-prohibition formula. The skillfully presented petition won the instant support of the chemical journals and convinced the technical men of the Treasury Department. However, the secretary still hesitates to take the necessary step, apparently fearing a possible unfavorable public reaction such as was stirred up some years ago when the "poisoned alcohol" propaganda got beyond the control of its makers. Friends of denaturation are confident that early in 1935 the secretary will overcome the reluctance that, although perhaps a purely natural one, is nevertheless unfounded in fact.

Hardwood distillation improved its position somewhat during 1934 by the elimination of several obsolete plants. It is to be expected that the coming year will witness the further slight weeding-out process, but well managed operation with modern equipment is probably in a better position than a year ago.

Direct extraction of acetic acid which eliminates the cumbersome

MOST RECENT CENSUS DATA

Offal (heads, bellies, shoulders, etc.), pounds	79,211,695	85,024,720
Value	$14,914,031	$12,747,982
Harness leather, value	$1,950,676	$1,845,825
Union black, sides	118,569	57,961
Value	$504,417	$364,005
Oak black and russet, sides	289,349	255,700
Value	$1,446,259	$1,481,820
Bag, case and strap leather		
Sides	563,001	724,731
Value	$2,633,956	$3,397,237
Skirting leather		
Sides	24,752	12,204
Value	$148,889	$108,920
Collar leather		
Sides	206,919	147,088
Value	$786,392	$499,393
Lace leather		
Sides	69,564	55,873
Value	$236,487	$241,890
Welting leather		
Pounds	1,818,945	1,667,334
Value	$672,294	$626,107
Upholstery leather[1] (automobile, furniture, and carriage)		
Whole-hide grains and machine-buffed, hides	139,372	283,568
Value	$1,176,564	$2,548,998
Splits (main and second), pieces	278,939	362,115
Value	$698,433	$1,589,949
Upper leather (other than patent), total value	$102,661,127	$107,167,660
Cattle (including kip side)		
Sides	15,478,846	12,482,680
Value	$39,790,605	$32,428,300
Calf		
Skins	12,101,507	10,194,684
Value	$23,934,947	$25,791,144
Kip (except kip side)		
Whole skins	177,679	267,930
Value	$474,281	$1,103,070
Goat and kid		
Skins	38,113,747	34,978,323
Value	$30,875,330	$37,285,482
Sheep and lamb (shoe stock), and cabretta		
Skins	8,970,522	9,860,440
Value	$5,032,488	$7,563,758
Horse, colt, ass, and mule		
Half and whole fronts, equivalent half fronts	34,875	83,749
Value	$63,996	$239,855
Butts, equivalent butts	270,572	
Value	$299,791	$625,088
Shanks	159,675	
Value	$80,541	
Other, value	$2,109,148	$2,130,963
Patent leather (other than upholstery), total value	$7,400,170	$11,289,327
Cattle (including kip side), sides	2,810,647	3,554,775
Value	$7,261,359	$10,658,985
Other, value	$138,811	$630,342
Glove and garment leather, total value	$17,609,463	$15,302,597
Cattle grains (including foreign-tanned kip), sides	365,336	96,383
Value	$995,611	$270,454
Cowhide, bellies	256,141	386,928
Value	$162,126	$391,268
Horse, colt, ass and mule, half and whole fronts		
Equivalent half fronts	1,269,141	1,503,066
Value	$2,206,417	$3,253,010
Butts and shanks, value	$403,867	$421,420
Sheep and lamb (except shearlings), skins	12,190,091	8,214,101
Value	$7,585,662	$6,407,388
Shearlings, skins	1,561,860	1,371,155
Value	$1,413,661	$1,322,158
Other, value	$4,842,119	$3,236,899
Fancy and bookbinders' leather, value	$5,546,057	$9,934,899
Buffings (finished), hides	1,099	1,248

[1]Exclusive of russet buffings. The figures for this item are withheld to avoid disclosing data for individual establishments, but the value is included in the "other leather" item at the end of the table.
[2]Includes value of russet buffings. See footnote 1.

MOST RECENT CENSUS DATA

LEATHER, Contd.

Value	$12,525	$8,978
Sheep and lamb and cabretta, skins	2,184,619	2,806,760
Value	$2,124,357	$2,986,979
Calf and kip, skins	310,199	248,750
Value	$874,686	$743,348
Goat and kid, skins	149,428	....
Value	$298,352	$6,195,594 (Value and Other, value combined)
Other, value	$2,236,137	
Side splits (other than upholstery), finished		
Number	17,864,590	14,499,165
Value	$10,060,227	$9,761,938
Other leather, value[1]	$4,838,587	$7,375,508

CEMENT

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Barrels	63,473,189	125,429,071
Value	$85,600,717	$140,959,906

MANUFACTURED GAS

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Total production, M cu. ft.	239,282,225	301,471,063
Sold	222,073,764	283,382,411
Consumed in plant and unaccounted for	17,208,461	18,088,652
Water gas, M cu. ft.	152,500,419	195,199,177
Coal gas, incl. coke-oven gas, M cu. ft.	81,706,887	97,301,756
Oil gas, M cu. ft.	4,744,451	8,170,875
Other kinds of gas, M cu. ft.	330,468	799,255
By-Products		
Total produced for sale, value	$28,635,007	$37,572,497
Coke		
Total production, tons	4,452,976	5,548,343
For sale, tons	3,181,815	3,598,527
Value	$20,671,433	$26,672,584
Consumed in plant, tons	1,271,161	1,949,816
Screenings and breeze		
Total production, tons	668,718	648,941
For sale, tons	168,189	66,058
Value	$407,513	$179,538
Consumed in plant, tons	500,529	582,883
Tar		
Total production gallons	174,502,676	190,451,802
For sale, gallons	113,581,449	149,891,320
Value	$4,521,177	$6,631,144
Consumed in plant, gallons	60,921,227	40,560,482
Ammonia (NH_3) content		
Pounds	39,016,457	37,852,903
Value	$851,715	$1,720,916
Crude light oil		
Gallons	6,479,688	6,884,489
For sale, gallons	3,546,607	3,924,621
Value	$265,937	$289,072
Light-oil derivatives		
For sale, gallons	2,672,695	3,142,022
Value	$410,337	$488,219
Drip and holder oil		
For sale, gallons	2,659,330	3,499,218
Value	$171,393	$242,836
Other by-products value	$1,335,502	$1,348,188
Gas and by-products, products not normally belonging to the industry, and receipts from rents and sales of lamps and appliances, not reported separately	[1]$2,394,343	

[1]Not included in total above.

PAINTS AND VARNISHES

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Paints, varnishes, and related products, total value	$284,485,764	$346,769,317
Made in the paint and varnish industry	$267,557,739	$318,818,119

BETTER SERVICE FOR

acetate of lime process is competing successfully with synthesis. A new unit now nearing completion is confidently expected to demonstrate that direct extraction is feasible even in plants of smaller capacity.

Charcoal distribution is better organized than ever before. Elimination of unprofitable units, expansion of direct acid extraction units, better marketing of charcoal and a return of denaturing grade wood alcohol to its rightful market, promise a decided improvement in one of the oldest of our chemical industries.

NITROCELLULOSE

By M. G. Milliken
General Manager,
Cellulose Products Division,
Hercules Powder Co., Wilmington, Del.

A MARKED IMPROVEMENT in the method of preparing lacquers has just been introduced to the protective coating industry. This method not only permits the use of higher viscosity nitrocellulose, but provides both a material cost and an application cost lower than exists at present in lacquer practice. Nitrocellulose emulsions represent a development which points the way to an entirely new method for the use of nitrocellulose in protective coatings. It is realized that many of the practical details for the commercial exploitation of nitrocellulose emulsions have not as yet been worked out, but preliminary experimental results are so encouraging as to show many widespread possibilities of tremendous potential value to the consumers of this commodity.

The process consists briefly in eliminating most of the water miscible solvents using an emulsifying agent compatible with the film and finally mechanically emulsifying the lacquer in the water. Emulsions obtained by this procedure have the advantage over ordinary lacquer of containing a much higher content of solids, as well as other desirable features such as better brushing qualities in that the first brush coat is not lifted by a second coat. A marked reduction in flammability is produced to such an extent that a Bunsen flame introduced into a can of nitrocellulose emulsion will not cause burning for at least three or four minutes, or until all the water has been evaporated. This feature should be of tremendous importance in reducing any possible hazard surrounding the use of ordinary lacquer.

By the use of nitrocellulose emulsions a large increase in total solids content of sprayable lacquer is possible, thus eliminating one of the chief disadvantages of present lacquers. The possibility of depositing protective coating films with increased solids should widen the application of nitrocellulose lacquers and is a new use designed to render better and more worthwhile service to the consumers of nitrocellulose.

Nitrocellulose emulsions appear in general to have much value in the protective coating industry wherever high total solid content is desired with minimum application. Such products should prove of much value in that they open up many new uses where the reduced solid content of the ordinary lacquer has prevented the use of such products.

Another recent development in the use of nitrocellulose lacquers which is attracting much interest is as a coating upon paper products such as the finishing of cartons for packaging. Nitrocellulose lacquers present many opportunities for beautifying paper containers and for finishing them with a coating which will resist water, oils and greases. This will give a longer life to the package, besides enabling it to be placed in the consumer's hands in cleaner condition. The application of nitrocellulose lacquers upon paper coatings for containers promises to open up many new fields of interest to both the producer and consumer of chemicals.

PAINT AND VARNISH

By John P. Hubbell
Singmaster & Breyer
New York, N. Y.

IT IS HARD to discuss producer and consumer relationships for pigments without entering into a general discussion of the paint and varnish manufacturer's relations with those from whom he buys his raw materials. The problem is not how the raw material producer can dissuade the paint manufacturer from making his own raw materials, but rather how the paint manufacturer can meet the competition of raw material producers who are also making and selling paint direct to the public.

Most important advances in the paint and varnish industry have come about through the research and development work of the raw materials suppliers. The industry was satisfied with this situation because it felt that when a new material was developed the widest possible market would be

desirable and it would be sold to all customers on an equal basis. The paint man confined his efforts to working out the best and most economical combinations of available materials for the various uses to which his products were put.

There has been an increasing tendency in recent years, however, for raw materials producers to attempt to improve their competitive position: first, by going into the paint business themselves, and second, by patenting not only specific raw materials and the methods of producing them, but also by patenting the use of these raw materials in paint products.

The paint industry is primarily a merchandising business. Salesmanship, purchasing ability, and the intimate knowledge of one's customers which makes possible a safe but flexible credit policy and the adaptation of one's products to innumerable special applications, are more important than the highest degree of manufacturing efficiency. Hence, the paint industry as a whole has not been greatly upset because certain raw material producers have entered into direct competition by making paint themselves.

The recent tendency among the raw materials producers to introduce patent control, however, is an entirely different matter. If it continues to increase, the paint manufacturer must either accept the burden of research and development in the raw material field or be gradually forced into the position of becoming simply a distributing department in a raw material producing and paint manufacturing combination.

The kind of research and development work which is necessary to meet this threat requires expenditures on a scale which is impractical for most paint companies. The paint business is still largely decentralized. There are many moderate sized companies that can make and sell paint in their chosen territories on a strictly competitive basis with their large competitors. This will no longer be true if the use of all new materials is to be controlled by patents.

Unless some way can be found for the moderate sized companies to carry on group research, using the patents which would result to maintain their bargaining position, the paint industry will witness the gradual consolidation of the smaller companies into a few large units which will be able to carry the necessary research and patent burden. Each of these units will naturally ally itself with certain raw material producers, and the paint and varnish industry will become merged with the raw material producing industry.

POTASH

By R. S. McBride
Editorial Representative, Chem. & Met., Washington, D. C.

POTASH production in the United States has not only created new competitive relations among producers and marketers, but also has made necessary a consideration of the proper national policies with respect to import, supply, and price of this vital fertilizer raw material.

Before the World War the United States was dependent on imports of potash. During the war period numerous enterprises undertook to recover potash, many of them operating at high cost which was feasible because of the great importance of the chemical produced at a time when German and Alsatian supplies were wholly cut off. At the close of the War, however, with the resumption of potash import, practically all domestic producers found continued operation uneconomic. Certain byproduct operations on a small scale continued, as the recovery of potash from alcohol wastes; but only a single company recovering potash from the brine of Searles Lake, California, was able to maintain domestic production on any nationally significant scale.

Impressed with the importance of establishing, if practical, new domestic sources, the Federal Government expended substantial sums on core drilling of territory in Southwestern states at points believed to be underlain with potash mineral beds. Then or soon thereafter commercial production from one mine at Carlsbad, New Mexico, began in 1931. Late in 1933 a second mine in the same area began produc-

INDUSTRY'S CHIEF PROBLEM

By HUGH A. GALT,
President, Southern Alkali Corporation, Barberton, Ohio

I CONSIDER the chief problem of ours and all other great industries is a settlement of the labor situation which in my opinion would mark the beginning of an era of greater prosperity than this country has ever before experienced. We are all ready to expand and employ labor when this one problem is definitely settled.

MOST RECENT CENSUS DATA

Made as secondary products in other industries	$16,928,025	$27,951,198
Pigments (colors) made for sale		
Total pounds	1,168,596,064	1,279,519,379
Total value	$60,535,509	$68,991,790
White lead, dry		
Total production, pounds	157,578,163	221,176,753
Consumed where made, pounds	68,374,880	96,005,393
Made for sale, pounds	89,203,283	125,171,360
Value	$4,439,801	$6,899,086
Lead oxides		
Total production, pounds	158,918,499	168,616,692
Consumed where made, pounds	6,157,904	3,680,815
Made for sale		
Litharge, pounds	107,280,853	119,349,709
Value	$5,148,223	$6,202,394
Other lead oxides, pounds	45,479,742	45,586,168
Value	$2,666,776	$2,829,300
Zinc oxide, pounds	233,134,932	239,755,975
Value	$11,961,765	$14,306,981
Lithopone, pounds	273,306,487	307,489,496
Value	$11,695,715	$12,926,953
Iron oxides, pounds	61,954,046	60,605,722
Value	$2,069,239	$1,830,449
Chrome yellow, orange, and green, pounds	37,399,830	38,751,602
Value	$5,731,865	$5,849,875
Other fine colors, pounds	9,472,493	14,380,701
Value	$5,007,432	$5,288,858
Other dry colors, pounds	303,774,153	318,326,156
Value	$11,097,323	$11,846,907
Pulp colors, sold moist, pounds	7,590,245	10,102,490
Value	$717,370	$1,010,987
Paints, total value	$111,270,337	$147,556,536
In paste form, total pounds	183,965,425	236,076,454
Total value	$16,921,936	$25,402,215
White lead in oil, pounds	111,844,641	138,716,223
Value	$8,511,428	$13,017,246
Colors in oil, pounds	19,959,336	22,784,084
Value	$3,450,255	$4,508,354
Other paints in paste form, pounds	52,161,448	74,576,147
Value	$4,960,253	$7,876,615
Mixed, ready for use, total gallons	63,236,012	74,611,903
Total value	$89,645,212	$115,783,307
Paints in oil, gallons	41,345,551	35,748,759
Value	$61,904,256	$60,188,230
Other ready-mixed and semi-paste paints, gallons	21,890,461	38,863,144
Value	$27,740,956	$55,595,077
Water paints and calcimines, dry and in paste form, pounds	100,221,740	117,389,693
Value	$3,936,307	$5,014,907
Plastic paints, pounds	11,655,926	14,135,497
Value	$766,882	$1,356,107
Varnishes, japans, and lacquers (including enamels), total value	$105,763,680	$121,583,660
Oleoresinous varnishes		
Gallons	24,729,511	25,988,364
Value	$25,626,630	$28,931,678
Spirit varnishes, not turpentine, gallons	5,093,452	5,531,202
Value	$5,062,065	$6,902,924
Varnishes other than oleoresinous and spirit, gallons	4,126,738	5,130,560
Value	$4,046,145	$5,715,243
Pyroxylin products:		
Clear lacquers:		
Gallons	7,226,366	7,872,241
Value	$9,614,841	$12,501,466
Lacquer enamels:		
Gallons	7,422,965	8,491,947
Value	$15,517,894	$20,315,105
Other pyroxylin products, value	$7,462,409	$13,193,993
Drying japans and driers:		
Gallons	2,107,211	2,372,069
Value	$1,644,975	$1,974,396
Baking japans:		
Gallons	2,229,648	2,313,925
Value	$1,570,381	$1,747,866
Enamels, oil and varnish base: Gal.	17,878,542	15,121,516

BETTER SERVICE FOR

MOST RECENT CENSUS DATA

PAINTS, Contd.

Value	$32,788,591	$29,116,730
Other products of the varnish group, value	$2,429,749	$1,184,259
Varnish stains		
Gallons	1,947,915	1,658,481
Value	$2,438,704	$2,460,702
Fillers (liquid, paste, and dry)		
Value	$861,817	$1,123,093
Putty		
Pounds	47,368,937	56,322,863
Value	$1,738,048	$2,434,463
Bleached shellac		
Pounds	11,156,028	10,731,259
Value	$1,877,669	$2,619,073

PAPER AND PAPERBOARD

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Total tons	9,190,017	9,381,840
Total value	$521,552,577	$631,106,209
Produced for sale, tons	6,877,131	6,939,706
Value	$404,403,910	$498,202,661
Transferred to other plants of same company, tons	1,266,083	1,259,025
Value	$60,308,368	$65,118,228
Consumed where made, tons	1,046,848	1,183,109
Value	$56,840,299	$67,785,320
Newsprints and similar paper, tons	1,213,076	1,514,543
Value	$47,836,504	$86,143,284
Newsprint, standard, in rolls and sheets, tons	928,332	1,203,263
Value	$32,205,982	$63,654,376
Hanging paper, tons	66,137	85,974
Value	$3,346,080	$5,800,106
Catalog paper, tons	62,954	89,382
Value	$4,249,752	$7,064,325
Poster, novel, news tablet, lining, etc., tons	155,673	135,924
Value	$8,034,690	$9,624,477
Book paper, total tons	1,080,196	1,208,674
Value	$83,244,346	$120,282,799
Machine-finished, sized, and super calendered, tons	802,248	952,142
Value	$60,837,384	$94,977,883
Body stock for coated paper, tons	176,513	199,946
Value	$13,606,481	$18,345,062
Lithograph, tons	16,737	10,036
Value	$1,478,635	1,081,260
Offset, tons	26,515	23,454
Value	$2,913,085	$3,146,490
Text, tons	5,699	23,096
Value	$767,328	
Other book paper, tons	52,484	$2,732,104
Value	$3,641,433	
Cover paper, tons	12,697	23,520
Value	$2,104,359	$4,371,668
Writing paper, total tons	478,356	487,598
Value	$61,329,986	$77,865,416
Rag-content, tons	65,998	79,718
Value	$19,506,687	$26,959,386
Sulphite bond, tons	282,766	246,971
Value	$29,246,639	$31,304,209
Other chemical woodpulp writing papers, tons	129,592	160,909
Value	$12,576,660	$19,601,821
Wrapping paper, total tons	1,440,029	1,401,667
Value	$95,767,523	$110,885,376
Sulphite, tons	267,487	199,780
Value	$18,706,254	$17,604,820
Sulphate (kraft), tons	932,598	867,743
Value	$51,675,204	$58,714,568
Greaseproof, tons	15,671	10,774
Value	$2,745,930	$1,755,817
Glassine, tons	38,441	37,666
Value	$7,131,558	$6,684,742
Vegetable and other imitation parchment, tons	9,186	285,704
Value	$1,184,359	$26,125,429
Other wrapping paper, tons	176,646	
Value	$14,324,218	
Tissue paper, total tons	406,760	394,623
Value	$37,711,156	$45,041,174
Toilet, tons	202,861	150,652

TIME TO CALL

By CHARLES BELKNAP
President, Merrimac Chemical Company, Boston, Mass.

TO PREDICT the probable trend of events and outlook for 1935 is a game equal to poker. Psychology will largely direct events. From tabulated results of the past election, 55 per cent—53 per cent were Democratic votes, and 45 per cent—47 per cent were Republican votes; an interesting field for psychology to become effective in.

The present Administration has its problems both political and economical. Industry must recognize these problems, and the Administration must respect the Constitutional rights of its citizens, in any cooperative attempt to successfully work out the future. Neither can disregard the other. The gravest error an individual can make is to create a situation which he cannot handle. That may become the situation of this country, if sound advice and able assistance is not heeded and utilized immediately. If both are disregarded, then the answer is inflation, followed by destruction of all values; an incredible and unnecessary situation to occur in a nation, 80 per cent of whose citizens are property holders in one form or another, and whose general condition is far superior to that of any other country in the world.

Chemical industry has done a grand job in caring for its personnel throughout the entire depression. It is a vital industry in the economic welfare of the country, and is, besides, the guardian of the health of the Nation. The outlook for the industry's future is decidedly a greater opportunity to serve, providing uncertainty does not retard and hamper. To forecast 1935, again the poker game—"I call."

tion. The brine recovery facilities at Searles Lake have also been enlarged during recent years. As a result the productive capacity for potash in the United States is today at least equal to one-half the normal requirements. Much further expansion of productive capacity, especially of the New Mexican mines, is undoubtedly feasible, so that complete independence of foreign supplies would be possible in the event of interrupted imports. Some of this expansion is, in fact, now under way.

The domestic production of potash from all sources, but principally from Searles Lake, was approximately 10,000 to 12,000 tons of K_2O equivalent per year until 1923. In that and the three subsequent years the domestic production was between 20,000 and 25,000 tons, or approximately 10 per cent of the then current domestic consumption requirements. Enlarged capacity in California, somewhat greater byproduct recovery of potash, and finally the opening of the New Mexican mines, have increased the output of domestic potash so that for each of several years the output was about 60,000 tons of K_2O equivalent. In 1933, however, over 140,000 tons were produced and in 1934 about the same tonnage of K_2O.

From 80 per cent to 90 per cent of the potash consumed in the United States is used as a fertilizer material, principally in mixed fertilizers. During peak years of active agricultural production from 350,000 to 400,000 tons of K_2O equivalent were needed for this purpose and for chemical applications. Hence during the period 1928 to 1930 approximately one-sixth of domestic requirements were supplied by domestic production. But with the shrinkage of agricultural activity, and the consequent reduction of K_2O usage below 300,000 tons, the approximately constant production of potash was equivalent to a higher percentage of the total requirement, in 1932 furnishing about 37 per cent of the total used in all applications. In 1933 and 1934 still a higher percentage of total need was met by domestic supplies.

Until very recently all potash imported into the United States has been supplied by N. V. Potash Export My., the Dutch corporation which is the American selling agent for the potash cartel. Comparatively recently a large Spanish producer not a member of the cartel has imported into U. S. considerable quantities of potash, and is in part responsible for the renewed competition and consequent price decline in American markets. This and one other Spanish producing company and the Russian producers of potash are the only important commercial units not affiliated with the cartel, except, of course, the three American companies.

Production of potash in California is altogether by American Potash & Chemical Co., a concern which makes both potash and borax, and which was for many years owned by the British borax interests. A few years ago, however, it was reliably reported that controlling stock interest in this concern had been deposited with certain New York bankers by the British owners, because of a purchase by un-

named other concerns. No official statement of the identity of the new owners has ever been issued. It is commonly believed in the trade, however, that some of the important Continental European potash interests now control this Californian enterprise.

The first mine opened in New Mexico is owned jointly by certain American petroleum interests and by the borax enterprise which has been for years competitive with American Potash & Chemical Co. This borax enterprise acknowledges parent company control in another British firm. However, the American mine operated by this group under the name U. S. Potash Co., appears under the direction of those responsive primarily to the two American company part owners.

The second potash mine of New Mexico, known as Potash Co. of America, is said to be owned by American interests, with headquarters in Denver. It is believed not to have any foreign affiliations.

These matters of ownership and indirect control are of importance to American potash users and to the Government, because of recent price wars affecting domestic potash supply. They also raise questions of international policy. The operations of the industry in 1934 are particularly significant in this regard.

During the summer of 1934 American Potash & Chemical Co. announced a large cut in the price of potash from 60 cents per unit to 40 cents per unit, and continued the customary seasonal discounts which are intended to induce purchases and acceptance of delivery by users well in advance of the consuming season when mixed fertilizer is made. It has been openly charged by domestic interests that this price cut was made by the California company in response to orders of the European proprietors. It was, of course, also charged that by this price cut the European cartel was hoping to destroy the growing American enterprises and thus resume domination of the American market. The threat of successful Spanish competition may also have been a significant factor as Spanish potash importers have this year certainly gained a substantial share of the fertilizer potash business near the Eastern Seaboard.

Under the provisions of NIRA there has been attempted an establishment of a number of code provisions which would eliminate certain trade practices, charged by many to be "unfair" if not actually illegal. Particularly, American producers have been desirous of securing an elimination of the practice of importers which guarantees purchasers of their potash against price decline. Importers have in the past supplied generous quantities of potash early, and through large seasonal discounts amounting to 12 per cent in summer months, induced the filling of consumers' warehouses long in advance of consumptive need. Purchasers have been willing to do this because they were both guaranteed against any decline in price by the importers, and also were given long credits for the deliveries, payments being deferred until such time as the potash was actually removed from the warehouse for fertilizer mixing. Domestic producers have opposed both price guarantees and such extended credit. No effective code regulation has yet been achieved.

It is charged that in certain cases import of potash has amounted to "dumping." However, no such charge has been formally entered. The experience of other domestic interests in undertaking to demonstrate dumping and thereby eliminate low price competition, makes it evident that the domestic potash industry is very unlikely to be successful in meeting import competition in such fashion.

There is no tariff on potash. It is highly unlikely that the agricultural interests of the country would be willing to have a tariff imposed on a material the bulk of which is purchased by farmers. The placing of a tariff or other limitation based on the relative cost of production in the United States and abroad would be particularly difficult, because in several instances potash is but one of several co-products. The operations of American Potash & Chemical Co. at Searles Lake, Calif., are an excellent example of such enterprise, for that firm has made borax and potash for many years, and more recently has begun production of salt cake (sodium sulphate) and soda ash as additional products. There is no clearly recognized means by which, in the case of such multi-product operations, it is feasible to allocate costs accurately to one product or another. However reasonable allocations may be, the decisions are necessarily based on opinion, and may therefore seem, if not actually be, arbitrary.

Even the fertilizer industry, though anxious to secure potash at low cost for use in mixed fertilizers, recognizes the potential danger of unrestricted import competition. There is always the possibility that such competition,

MOST RECENT CENSUS DATA

Value	$16,033,585	$14,319,971
Other tissue paper, tons	203,899	243,971
Value	$21,677,571	$30,721,203
Absorbent paper, total tons	79,832	76,592
Value	$12,081,629	$14,774,037
Blotting, tons	7,045	9,565
Value	$1,057,972	$1,775,628
Other absorbent paper, tons	72,787	67,027
Value	$11,023,657	$12,998,409
Building papers, total tons	328,275	395,359
Value	$14,059,962	$18,129,372
Sheathing, tons	22,288	26,341
Value	$1,479,797	$791,407
Asbestos and asbestos-filled, tons	20,449	44,002
Value	$1,372,962	$3,010,647
Rag felts and other building papers, tons	285,538	325,016
Value	$11,207,203	$14,327,318
Other paper, tons	74,486	31,441
Value	$6,236,235	$4,500,770
Paperboards, tons	4,076,290	3,847,823
Value	$161,180,877	$149,112,313
Container boards, tons	2,020,617	1,903,792
Value	72,270,749	62,155,074
Folding box boards (bending), tons	957,626	905,710
Value	$38,566,611	$37,946,800
Set-up box boards (non-bending), tons	571,898	562,176
Value	$19,707,593	$16,055,441
Binders' board, tons	26,429	32,703
Value	$1,563,272	$2,177,414
Cardboard, tons	71,667	74,102
Value	$6,744,306	$8,045,898
Leatherboard, tons	21,437	26,715
Value	$1,799,302	$2,581,467
Pressboard, tons	7,241	4,000
Value	$1,168,219	$822,828
Other boards, tons[1]	399,375	338,625
Value	$19,360,825	$19,327,391

[1]Figures include data for building boards, as follows: For 1933, 58,048 tons, valued at $2,873,402; for 1931, 112,049 tons, valued at $6,995,825.

WOOD PULP

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Total tons	[1]4,329,248	[1]4,409,344
Total value	[1]$125,314,731	[1]$156,174,967
Mechanical pulp		
Total tons	1,197,553	1,449,240
Total value	$23,612,012	$34,100,157
Not steamed, tons	1,079,066	1,363,726
Value	$21,269,727	$31,687,745
Steamed, tons	118,487	85,514
Value	$2,342,285	$2,412,412
Sulphite pulp		
Total tons	1,286,619	1,417,523
Total value	$53,108,144	$70,361,620
Unbleached, tons	543,957	676,711
Value	$19,394,755	$28,053,795
Bleached, tons	742,662	740,812
Value	$33,713,389	$42,307,825
Sulphate pulp		
Total tons	1,263,222	1,033,439
Total value	$29,170,894	$28,839,604
Unbleached, tons	1,195,938	979,500
Value	$26,618,287	$26,265,077
Bleached, tons	67,284	53,939
Value	$2,552,607	$2,574,527
Soda pulp		
Total tons	[2]547,919	[3]460,682
Total value	[2]$19,038,995	[3]$22,181,487
Unbleached, tons	[2]185,337	[4].........
Value	$3,969,631	[4].........
Bleached, tons	362,582	[4].........
Value	$15,069,364	[4].........
Screenings		
Total tons	33,935	48,460
Total value	$384,686	$692,099
Mechanical, tons	4,243	10,115
Value	$45,499	$96,256
Semi-mechanical, tons	26,692	38,345
Value	$339,187	$595,843

[1]Exclusive of small quantities of cotton pulp, cottonseed-hull-shavings pulp, rag pulp, and reclaimed paper pulp for both years and, in addition, straw pulp for 1933. [2]Includes data for semichemical pulp and for a small quantity of pulp not covered by items specified; included here to avoid disclosing the production of individual establishments. [3]Soda fiber, 374,054 tons, valued at $20,960,628; semichemical and other wood pulp, 86,628 tons, valued at $1,220,859. [4]Withheld to avoid disclosing approximations of amounts produced by individual establishments.

MOST RECENT CENSUS DATA

PETROLEUM PRODUCTS

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Aggregate value of refinery products..	$1,360,521,559	$1,508,037,557
Light products of distillation (except tops)		
Total gallons.........	16,354,817,643	17,432,722,551
Total value.........	$773,181,965	$846,254,393
Gasoline, gallons....	16,094,530,726	16,949,078,294
Value...............	$759,183,106	$824,300,400
Naphtha, gallons....	228,515,546	450,396,862
Value...............	$12,251,380	$20,145,531
Benzine, gallons.....	31,771,371	33,247,395
Value...............	$1,747,479	$1,808,462
Illuminating oils		
Gallons.............	1,949,862,606	1,732,908,474
Value...............	$78,127,721	$72,284,654
Fuel oils		
Total gallons.........	13,295,106,853	13,999,089,289
Total value.........	$253,236,655	$267,881,011
Distillates, gallons...	1,598,816,084	1,013,170,628
Value...............	$49,647,648	$27,115,633
Gas oils, gallons.....	1,977,442,889	2,525,229,500
Value...............	$53,930,839	$67,836,996
Residual fuel oils, gallons............	9,718,847,880	10,460,689,161
Value...............	$149,658,168	$172,928,382
Partially refined oils sold for rerunning		
Total gallons.........	1,130,067,737	1,311,125,736
Above fuel oil, gallons.............	760,696,564	890,943,838
Fuel oil, gallons......	345,215,231	382,937,333
Below fuel oil, gallons.............	24,155,942	37,244,565
Total, value.........	$23,733,608	$28,418,141
Lubricating oils		
Total gallons.........	1,047,211,662	1,145,430,988
Total value.........	$142,444,081	$197,093,248
Black; cylinder; red, neutral, pale, and paraffin, gallons...	650,475,340	
Value...............	$74,177,605	
All other lubricating oils, including compounded (except cylinder) oils, gallons.............	396,736,322	1,145,430,988
Value...............	$68,266,476	$197,093,248
Liquid asphaltic road oils, gallons.......	300,243,118	375,116,314
Value...............	$8,343,122	$10,351,822
Greases		
Total gallons.........	41,923,024	45,210,801
Total value.........	$9,250,944	$12,224,547
Petrolatum, mineral jelly, etc., gallons.	14,710,994	16,353,098
Value...............	$1,854,740	$2,071,120
Axle grease and other lubricating greases, gallons............	27,212,030	28,857,703
Value...............	$7,396,204	$10,153,427
Paraffin wax		
Gallons.............	72,851,936	79,377,307
Value...............	$12,210,791	$13,339,676
Acid oil		
Gallons.............	85,627,032	84,559,997
Value...............	$1,014,729	$1,119,987
Liquefied petroleum gases		
Gallons.............	178,630,287	255,139,669
Value...............	$2,524,098	$5,778,926
Asphalt other than liquid asphalt		
Tons...............	1,789,798	2,462,102
Value...............	$17,931,591	$21,750,784
Petroleum coke		
Tons...............	1,751,412	2,025,484
Value...............	$5,581,928	$7,172,674
Other refinery products		
Value...............	$32,940,326	$24,367,694

RAYON

(All figures refer to production for sale, except as otherwise noted.)

	1933	1931
Products, total value[1]	$156,931,519	$132,632,416
Yarns		
Total pounds.........	213,497,850	150,879,496
Total value.........	$129,202,305	$112,282,407
Finer than 125 denier, pounds.......	61,165,733	32,959,202
Value...............	46,684,931	$30,525,206
125 to 150 denier, pounds............	129,538,587	100,022,948
Value...............	$71,587,582	$70,725,448
Heavier than 150 denier, pounds....	22,793,530	17,897,346
Value...............	$10,929,792	$11,031,753

when managed by such foreign monopoly control as that of the cartel, might break down domestic competition. Importers would then be free to raise prices without regard to costs either in the United States or abroad. Rather general support has been accorded in Washington, therefore, for the idea that some means should be established to regulate the competitive relations in potash and preclude competition destructive of American producers.

Some type of quotas for imports has perhaps been most favored among the various groups affected by or interested in American potash supply. However, no specific recommendations to that effect have taken official form, nor has any legislation to that effect been undertaken as yet. Possibly the most widely acceptable proposal, which may take the form of a proposed act of Congress during the coming winter, is along the following lines: Domestic producers would be allocated a certain percentage of the American market, or a certain quantity measured in tonnage. The allocation would be made on the basis of negotiation and agreement, but would be varied from time to time in accordance with the market price charged.

This proposal has been intended to encourage a supply of potash from domestic sources at the lowest practical price for the benefit of domestic users by offering a larger share or a larger tonnage in the domestic market whenever a lowering of price proves feasible. This, it is believed by the proponents, would preclude any unwarranted rise in price because of the partially protected nature of the domestic production. By modifying the quotas in accordance with the price, it is also argued that users would be likely to secure the benefit of improved technology and any proper benefits of vigorous, but fair, competition.

At the end of 1934 the following questions remain officially unanswered:

(1) Shall some restriction on import competition in potash be established by the Government?

(2) Shall some import quotas or domestic sales quotas be established in order to protect domestic industry?

(3) Are fair trade practice rules, especially to limit price guarantees, feasible for protection of U. S. industry without quotas, tariffs, or those other agreements normally prohibited by law as in restraint of trade?

(4) Finally, what present sacrifice of highly competitive prices should the fertilizer industry and the American farmer make in order to ensure stability of potash supply and permanent competition of domestic producers with importers?

SODIUM SILICATES

Editorial Staff Review

SEVERAL years ago the introduction of a new crystalline hydrate of sodium metasilicate (see *Chem. & Met.*, Dec., 1930, pp. 736-40) made available a new industrial alkali with properties of wide interest to several different groups of chemical consumers. Since that time the Philadelphia Quartz Co. has continued to study the question of whether other crystalline sodium silicates might offer sufficient elements of convenience to warrant their commercial production. This led, during 1934, to the development of sodium sesquisilicate which is known by the trade name Metso 99 and is covered by U. S. Patent No. 1,948,730. Sodium sesquisilicate is a white granular, free-flowing powder, completely soluble in water with only a slight positive heat of solution. It contains by weight 39.89 per cent Na_2O, 23.83 per cent SiO_2, 39.2 per cent H_2O and produces a pH of 11.6 at a concentration of 0.1 per cent by weight. While it is too alkaline for use in contact with human hands, it is, however, much less aggressive than caustic soda.

Over a concentration range from 0.1 per cent to 5.0 per cent, solutions of sodium sesquisilicate will be about 0.3 pH units above the metasilicate. It shares with metasilicate such properties as free rinsing, quick wetting power and buffer action.

The principal applications to be expected for the new sesquisilicate are in the field of cleaning where a greater activity than that of metasilicate is desired. For instance, heavy duty cleaning which involves the removal of materials such as paraffin oils, drawing compounds and fabricating greases is a logical field of application.

TANNING EXTRACTS

By Robert W. Griffith
Chemical Engineer, Champion Fibre Co., Canton, N. C.

THE domestic tanning extract industry maintained steady operations throughout 1934 at about 70 per cent of its productive capacity. Cooperation under the N.R.A. code undoubtedly proved beneficial to the industry as a whole. American tanners

CHEMICAL CONSUMERS

have indicated a wider appreciation of American chestnut extracts where quality is a determining factor. Quotations for foreign tanning materials have indicated that a higher price trend is to be expected for next year which will, of course, prove of benefit to the domestic industry. Its outlook for 1935 is, therefore, most encouraging.

ZINC OXIDE

By A. C. Eide
Sales Engineer
American Zinc Sales Co.
Columbus, Ohio

SINCE the paint and rubber industries are the largest consumers of zinc oxide, much of the producer's development work is concerned with improvements in the quality which will be of the greatest benefit to these two important industries. However, he must not lose sight of the many other consumers, even though the tonnage involved may be much smaller in comparison. Pigment manufacturers, in general, and zinc oxide producers in particular maintain extremely close technical contact with consumers, and no efforts have been shunned in order to develop special types of zinc oxide for particular applications, or to cope with any special situation that may exist in a consumer's plant, or to meet competition from other products, no matter how limited the volume.

At times this cooperation may have been carried to the extreme, for it is now possible to make a producer impart to a zinc oxide almost any conceivable physical or chemical property desired. This generous cooperation has solved many problems for the grateful consumer, but it has forced the producer to manufacture a multitude of different oxides in order to carry a complete line of products. If not curbed, this policy may ultimately lead to higher prices. Plant operations may easily become too complicated in spite of the flexibility of the process, and excessive inventories must be carried at plants and warehouses in many cities. Furthermore, the raw material inventories of the consumers have increased, and a bigger load is placed on the testing division when a large consumer is using a half-dozen different types of zinc oxide where one or two may have previously served the purpose quite satisfactorily.

Fundamentally, there are only two types of zinc oxide that are marketed to any extent; one is produced directly from ore by the so-called American process; the other is produced from metallic zinc by the French process. The modifications that any manufacturer can make in physical or chemical properties by control of raw materials and furnace operations are innumerable. During the past few years when a new type of zinc oxide was offered, it did not necessarily mean a product so improved that an older type could be discontinued. It was merely one more for the consumer to consider because it might have some special property of value in a limited field. For 75-90 per cent of the principal uses, a single type of zinc oxide will suffice; however, it is toward the remaining 10-25 per cent, in which some special modification is desired that a large number of varieties are directed. Consumers are largely without blame in this situation, but the present tendency on the part of producers is to bring about a sort of technical competition that may become as destructive to consumer and producer as a cutthroat price war.

No thought is here entertained of suggesting a discontinuation of the close consumer-producer relations, in fact, a reduction in the number of oxides required should be brought out through this channel. In some cases the differences in the chemical and physical properties of the different zinc oxides are so slight that it is doubtful if they are of any practical importance. The technique involved is thoroughly understood; therefore, if the problem were considered from the market angle as well as from a scientific point of view, improvements in the general types should undoubtedly follow which would give more universal satisfaction for the many special requirements.

MOST RECENT CENSUS DATA

Allied products (sheets, waste, etc.), value	$27,729,214	$20,350,009
Value added by manufacture[2]	$112,900,203	$96,451,558

[1]Manufacturers' profits or losses can not be calculated from the census figures because no data are collected for certain expense items, such as interest rent, depreciation, taxes, insurance, and advertising.
[2]Value of products less cost of materials, containers, fuel, and purchased electric energy.

RUBBER TIRES AND INNER TUBES

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Rubber tires and inner tubes, total value	$255,595,907	[1]$366,864,981
Pneumatic		
Motor-vehicle, except motorcycle		
Casings, total number	45,375,552	49,142,622
Total value	$221,050,854	$314,380,924
Balloon, number	39,472,028	42,325,675
Value	$177,205,783	$256,067,678
High-pressure, number	5,903,524	6,816,947
Value	$43,845,071	$58,313,246
Inner tubes, total number	42,065,009	49,166,765
Total value	$29,018,631	$44,615,809
Balloon, number	36,363,265	39,100,773
Value	$23,482,014	$34,784,598
High-pressure, number	5,701,744	10,065,992
Value	$5,536,617	$9,831,211
Motorcycle and bicycle casings, inner tubes, and single-tube tires, value	$2,238,027	$2,410,657
Solid and cushion		
Truck, number	79,350	112,351
Value	$2,057,379	$4,054,654
Other (tractor, trailer, industrial-truck, carriage tiring, etc.), value	$1,231,016	$1,402,937

[1]Includes $948,285 representing the value of tires and tubes as secondary products in rubber industries other than the tire and tube industry. A corresponding figure for 1933 will be included in the final report.

RUBBER GOODS

	1933	1931
Rubber goods other than tires, inner tubes, boots, and shoes, total value	$168,059,535	$193,526,766
Made in rubber industry, value	$126,016,354	$151,905,460
Made as secondary product in other industries, value	$42,043,181	$41,621,306
Rubber boots and shoes, total value.	$39,128,790	48,308,066

SOAP

(All figures refer to production for sale, except where otherwise noted.)

	1933	1931
Soap and related products, total value	....	$238,062,122
Made in the soap industry		
Soap and related products	$164,675,863	$228,330,828
Reported by kind	$156,373,966	$228,330,828
Not reported by kind	$8,301,897	....
Soap and related products and products not normally belonging to the industry, not reported separately	[1]$11,946,238	....
Made as secondary products in other industries	....	$9,731,294
Toilet soap		
Pounds	310,158,171	305,638,280
Value	$44,078,616	$53,064,155
Soap chips and flakes		
Pounds	398,500,432	351,076,793
Value	$24,885,814	$30,353,303
Laundry soap (in bar form), white and yellow		
Pounds	1,246,799,382	1,431,104,174
Value	$44,184,646	$68,385,117
Granulated and powdered soap		
Pounds	368,072,178	421,803,780
Value	$31,348,311	$40,976,787
Cleansers and scouring powders containing soap		
Pounds	165,627,469	164,067,301
Value	$5,870,912	$6,382,874
Shaving soap, cream, and powder		
Weight reported, pounds	10,201,811	10,452,597
Value	$5,334,209	$7,025,273
Weight not reported, value	[1]............	$4,528,008
Soap stock or soap base, for sale		
Pounds	24,040,954	8,977,784
Value	$671,458	$546,682
Soap and related products not reported by kind, value	[2]............	$26,799,923

[1]Not yet available; will be given in final report.
[2]Data incomplete; included principally in items "Soap and related products and products not normally belonging to the industry, not reported separately," and "Made as secondary products in other industries."

Alkali Trend Continues Slow Increase

EDITORIAL STAFF

OBSERVERS of the alkali scene are beginning to wonder, if they were not already wondering at the end of 1933, just what the ammonia-soda industry is planning to do with the extra capacity, either completed or shortly to be finished, in the South. Not that the year was any worse than was to be expected; in fact, it was better than the preceding year and only 2.5 per cent below 1929. However, capacity for soda ash, including natural soda, was 3,181,500 tons at the end of 1933. Today, finished capacity is about 3,251,000 tons and long before 1935 has passed the industry will have accumulated in the neighborhood of 3,566,000 tons capacity. Meanwhile, the peak year, 1929, saw a production of about 2,452,000 tons, while in 1934, our estimate indicates 2,390,000 tons produced. If 90 per cent of the total capacity is modern and useful, which is not unreasonable to assume, then, the observers ask themselves, what about the 25 per cent of *useful* capacity that will be unemployed at the operating rate of 1934? Few are sufficiently optimistic to foresee the gathering up of more than a little of the slack within the next few years. Rather, they expect to see curtailed schedules in several of the northern plants, southern plants operating at capacity by reason of their advantage of direct access to ocean shipment, and a gradual accumulation of alkali consuming plants in southern territory. Only a small part of the southern alkali capacity is at present required for southern consumers.

Total soda ash production is estimated to have increased in 1934 by 2.9 per cent over the 2,322,832 tons reported by the U. S. Census for 1933. Soda ash sales in 1934, estimated at 1,696,000 tons, exceed by 2.5 per cent the sales of 1,654,028 tons given by the Census for 1933. For 1931 the corresponding Census figures are 2,275,416 tons of production and 1,508,679 tons of sales. At the low point of the depression, 1932, production was estimated to have amounted to 1,952,000 tons so that it is evident that the 22.5 per cent increase from that valley has materially exceeded the rate of improvement of general business, an improvement of slightly under 10 per cent as determined by a comparison of the *Business Week's* averaged indices for the two years.

A number of significant trends were shown in the distribution of soda ash sales during the year. The largest percentage increase, 80 per cent in exports, was however, unimportant from a tonnage standpoint. Much more significant was the 13.7 per cent increase registered by the chemical uses, accounted for by the fact that the synthesis of sodium nitrate again increased, this time by an estimated 30 per cent. Small increases of 6.4 and 2.9 per cent in the fields of cleansers and modified sodas and of soap complete the "plus" picture. Soap is understood to have enjoyed the best year on record.

Use of ash for petroleum refining showed no change, not because there was no increase in refining, but because of changes in methods. Use in glass declined by 5.3 per cent, for the glass business has discovered that used beer

Estimated Distribution of Soda Ash Sales in the United States

Consuming Industries	1932 Short Tons	1933 Short Tons (Revised)	1934 Short Tons
Glass	362,000	507,000	480,000
Soap	173,000	170,000	175,000
Chemicals	415,000	510,000	580,000
Cleansers and modified sodas	88,000	94,000	100,000
Pulp and paper	66,000	80,000	70,000
Water softeners	45,000	47,000	40,000
Petroleum refining	8,000	8,000	8,000
Textiles	27,000	34,000	28,000
Exports	13,000	25,000	45,000
Miscellaneous	115,000	179,000	170,000
Totals	1,312,000	1,654,000	1,696,000

Estimated Distribution of Caustic Soda Sales in the United States

Consuming Industries	1932 Short Tons (Revised)	1933 Short Tons (Revised)	1934 Short Tons
Soap	85,000	86,000	93,000
Chemicals	96,000	100,000	109,000
Petroleum refining	93,000	87,000	80,000
Rayon and cellulose film	109,000	144,000	140,000
Lye	30,000	31,000	34,000
Textiles	30,000	38,000	33,000
Rubber reclaiming	8,000	9,000	9,000
Vegetable oils	9,000	9,000	8,500
Pulp and paper	34,000	40,000	37,000
Exports	55,000	60,000	65,000
Miscellaneous	38,000	41,000	50,000
Totals	587,000	645,000	658,500

bottles are coming back for refilling in enormous quantities and even milk bottles are being broken at a declining rate. Some sections of the glass industry encountered a marked upturn in business during the year, but they were not the large ash consumers. A small decrease of 5 per cent in miscellaneous uses shows no particular trend, although paper's poor year is reflected in a decline of 12.5 per cent in ash consumed by the pulp and paper industry. Ash consumption fell by 14.8 per cent in water softening and by 17.6 per cent in textiles which suffered doubly during the year, both through strikes and through the fact of a well-defined, two-year textile cycle, with the even-numbered years always relatively poorer than the odd-numbered years.

Caustic Soda

Caustic soda production increased about 7 per cent during 1934, yielding an estimated total of 735,000 tons, but 3.5 per cent below 1929. As indicated by the accompanying tabulation, this total is made up of about 438,000 tons produced from soda ash, plus another 297,000 tons of electrolytic caustic. Caustic produced by the lime-soda process declined very slightly, but that produced by electrolysis increased an estimated 20 per cent over 1933 figures.

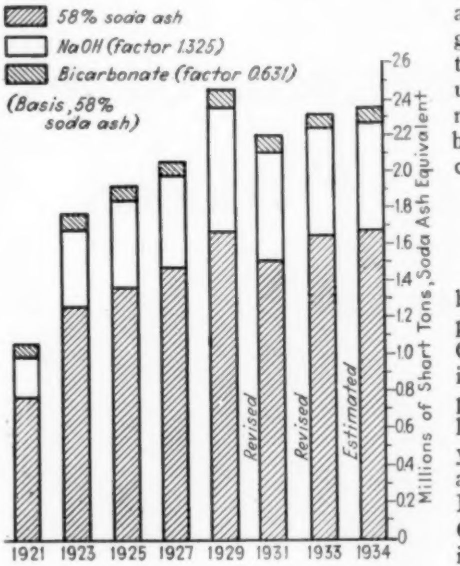
Sales of caustic soda increased during the year by an estimated 2.1 per cent, considerably less than the increase in production. Miscellaneous uses appear to have increased by 22 per cent, use for lye, 9.7 per cent and for chemicals, 9.0 per cent. Soap's banner year accounted for an 8.1 per cent increase in caustic use, while another 8.3 per cent improvement was shown by exports. On the negative side of the ledger, a small decline of 2.8 per cent is estimated for the combined use in rayon and cellulose film. Frankly, however, what decline actually took place is problematical, since the recovery situation in this field is in a state of flux, as will be discussed later.

Production of Caustic Soda in the United States

(Short Tons)

Year*	Lime-Soda	Electrolytic	Total
1921	163,044	75,547	238,591
1923	314,195	122,424	436,619
1925	355,783	141,478	497,261
1927	387,235	186,182	573,417
1929	524,985	236,807	761,792
1931	455,832	203,057	658,887
1933 (revised)	439,363	247,620	686,983
1934 (estimated)	438,000	297,000	735,000

*Figures for 1921-1933 are from the U. S. Bureau of the Census. Electrolytic caustic soda figures do not include tha made and consumed at wood-pulp mills, estimated at about 30,000 tons in 1927 and 1929, at about 24,000 tons in 1931, 21,000 tons in 1933 and 22,000 tons in 1934.



Above: Production for sale of principal ammonia-soda products in the United States

Left: How caustic soda sales were distributed during 1934

Opposite Page: How soda ash sales were distributed during 1934

Production of rayon decreased slightly, but cellulose film is believed to have increased enough so as very nearly to offset the decline in viscose for rayon. Meanwhile, during both years a substantial percentage of the caustic going to the rayon plants has been recovered, either by selling the spent steeping liquor to the soap makers and rubber reclaimers, or by actual recovery by dialysis.

Use of caustic in vegetable-oil refining changed slightly, a decrease of 5.5 per cent, commensurate with the decline in the entire vegetable oil industry. Pulp and paper consumed some 7.5 per cent less, and petroleum refining, 8.0 per cent less. The latter decrease results largely from the fact that a number of new solvent refining processes for lubricating oils have made a definite change downward in alkalis for petroleum refining requirements. The textile industry decreased its caustic soda consumption by about 13.1 per cent, as a result of its general decline. Rubber reclaiming actually increased during the year but the use of new caustic is believed to have remained about stationary, the difference being accounted for by purchase of waste caustic from the rayon industry.

New Plants

Of the three new soda ash plants that have been located in the South, only the plant of Southern Alkali Corp., at Corpus Christi, Tex., was completed and in operation at the end of the year. Its production, from the initial operation late in October until the turn of the year, is believed to have been considerably under 10,000 tons. The plant of Mathieson Alkali Works, at Lake Charles, La., which was to have gone into operation before the end of 1934, had not been entirely completed at last reports. Operation is expected to begin very shortly, while that of the Solvay Process Co.'s plant at Baton Rouge, La., will not commence before late Spring. It is understood that all of these plants encorporate refinements of detail, but that no considerable innovations are represented, except in so far as ocean shipment is possible from each. During the year the industry concentrated on this new construction, with the result that little in the way of improvement was carried out in older plants.

The question of caustic soda recovery in viscose rayon and cellulose film plants is one that is agitating the caustic industry. For every pound of cellulose regenerated in the form of yarn or film, the industry has required on the average 1.8 lb. of caustic. Caustic is employed as an 18 per cent solution and is used in removing unwanted hemi-cellulosic constituents, in mercerizing the cellulose, and as a solvent for the cellulose xan-

thate. Of course, only that part of the caustic which is expressed in the steeping presses, carrying with it the hemicelluloses, is recoverable and this, theoretically, amounts to about 0.6 lb. per pound of product. Certain losses, however, are estimated to reduce this recovery by present methods to 0.4 lb. per pound of product. This, it will be observed, represents a recovery of about 22 per cent, compared with a theoretical recovery of one-third.

At present, four viscose producers are understood to be recovering a considerable percentage of their available caustic waste by dialysis while most of the remaining industry is experimenting with the method. Dialysis apparatus at present in use includes the Heibig dialyser, used by one producer, the Asahi, used by two, and the Cerini, used by one. All of these are foreign processes. An American process for which considerably higher percentage recovery is claimed has recently been perfected and is understood to be under consideration by at least one manufacturer.

Still another process, for which complete recovery of all available waste caustic is claimed, is an all-chemical method developed by Harald Ahlquist, New York consulting engineer, and his associates. The 16.5 per cent waste liquor is evaporated to 50 deg. Bé. and treated to precipitate carbonates. The resulting liquor is dehydrated and fused to burn off the organic matter and the fused caustic, containing a small amount of carbonate, is treated to precipitate this remaining carbonate. The precipitate is combined with that from the first precipitation and is then recausticized. Recausticization, however, is not required for the bulk of the NaOH recovered since its travels through the process unchanged.

Sustained Improvement Cheers Sulphuric Acid Producers

EDITORIAL STAFF

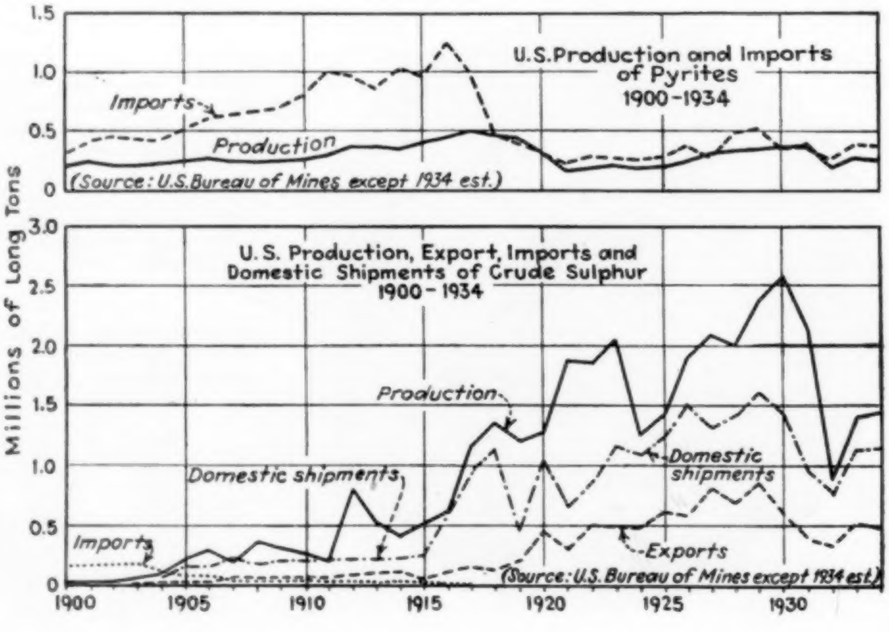
IN NEARLY every field of sulphuric acid consumption, 1934 showed consistent increase in acid use. To those acid men who look back with nostalgia toward the heights of 1923-30, the modest improvement registered by 1934 over 1933 may seem a pittance, but to those of us who still cling to the traditional regard of sulphuric acid as a business indicator, the year most satisfactorily matched its 9.9 per cent rise against the advance of 6 per cent in general business. The 5,660,000 tons (basis, 50 deg. Bé.) that was produced in the year just past may be small in comparison with the 8,300,000 tons of 1929, but it is a step in the right direction, as the accompanying chart of production, which is reproduced on the following page, will demonstrate.

Our annual study of the distribution of this acid among consumers leads to the conclusion that but three of the eleven principal using groups required less acid than in 1933, while the remaining eight increased consumption by amounts ranging as high as the 28.5 per cent increase shown by the explosives industry. With much activity in the acid using branches of the pigments industry, an increase of at least 23.5 per cent, and possibly more, was encountered. The improved position of the iron and steel industry is reflected in a 21.7 per cent advance in acid use, closely followed by the 20.8 per cent increase in fertilizers. The last, of course, was by far the most important on a tonnage basis and is to be explained by the fact that Government solicitude for the farmer has been pouring money into the fertilizer tills. The most frequently mentioned estimate of the improvement in farm purchasing power during 1934 is $1 billion.

Again, the farmer showed his influence in the case of acid consumption in the manufacture of coal products. Sulphate of ammonia production was up sharply, with an increase of 14.5 per cent in acid use. Miscellaneous uses increased on the average 12.1 per cent and metallurgical uses, other than iron and steel, by 8.4 per cent. A smaller improvement of 5.5 per cent in chemicals was nevertheless of considerable importance in tonnage.

Among those industries that decreased acid use, textiles was the unfortunate leader, down 16.7 per cent. Just as alkalis lost substantially in this field during 1934, sulphuric acid felt the impact of that industry's several troubles. Approximately a 5 per cent decline occurred in the case of rayon and cellulose film, due in part to a decreased output of these materials, and in part to a shift in the emphasis on the several processes. Petroleum refining took about 3.5 per cent less acid than in 1933, continuing the trend toward decreased acid requirements that has now been apparent for several years. In none of the industries suffering losses, it is to be noted, did any of the Government "pump-priming" activities have any effect. Help for the farmer and home modernization, however, can be seen clearly to have influenced several of those industries where improvement was made.

Indications are that the increase in acid production came about largely through a more than proportional increase in the use of brimstone and domestic pyrites. Acid made from brim-



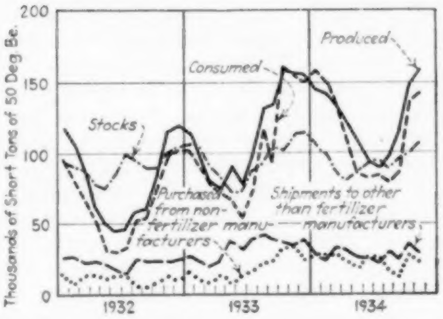
stone, including that used in zinc smelters to eke out byproduct gases, is estimated to have amounted to 3,685,000 short tons (basis, 50 deg. Bé.) in comparison with 3,198,000 tons estimated for 1933. Imported pyrites is believed to have supplied the necessary sulphur for about 904,000 tons of acid and domestic pyrites, including pyrrhotite, for 321,000 tons of acid. We believe that actual byproduct production at smelters was in the neighborhood of 750,000 to 800,000 tons, again on a 50 deg. Bé. basis, as compared with the 1933 total at smelters, as given by the U. S. Bureau of Mines, of 820,000 tons of byproduct production. This latter figure was divided between 444,000 tons produced at zinc smelters and 376,000 tons from copper plants. It includes no brimstone acid.

That the trend toward contact production has continued is indicated by our estimate of 50 per cent of the acid produced in contact plants, compared with 48 per cent in 1933 and 43 per cent in 1932.

Both production and domestic shipments of sulphur in the United States increased slightly during 1934. Production, estimated at 1,415,000 long tons, compares with 1,406,063 tons in 1933 and 890,440 tons in 1932. Domestic shipments of about 1,130,000 tons in 1934 compare with an official total of 1,114,853 in 1933. Exports, estimated on the basis of ten months' figures to have been 490,000 long tons, are considerably above the 352,610 tons of 1932, but 6 per cent below the 522,515 tons of 1933. Sulphur stocks held at the mines decreased again, as they have each year since the peak in 1931. With the withdrawal of about 205,000 tons from the Government-reported stocks of 2,799,950 tons above ground at the end of 1933, it would appear that stocks at the inception of 1935 amounted to about 2,795,000 tons.

Position of the United States as the premier sulphur producer of the world continued unchallenged during 1934, with an estimated world production of 2,003,000 long tons, of which some 70.7 per cent was mined in this country. In the order of their importance as producers, Italy, Sicily, Japan, Spain, Chile, Java and Portugal produced from natural sources, and Norway and Germany produced from byproduct sources, a total estimated at 588,000 long tons, compared with an estimated 583,000 tons in 1933.

Pyrites imports during 1934, practically all of which were consumed in making acid, have been estimated at 370,000 long tons, compared with 374,417 tons reported in 1933 and 253,248 tons in 1932. Domestic production of pyrites, including pyrrhotite and concentrates used at smelters, is estimated at 260,000 tons, compared with 284,311 tons reported in 1933 and 189,703 tons in 1932.



Sulphuric acid in fertilizer plants, 1932-1934 (U.S. Bureau of Census)

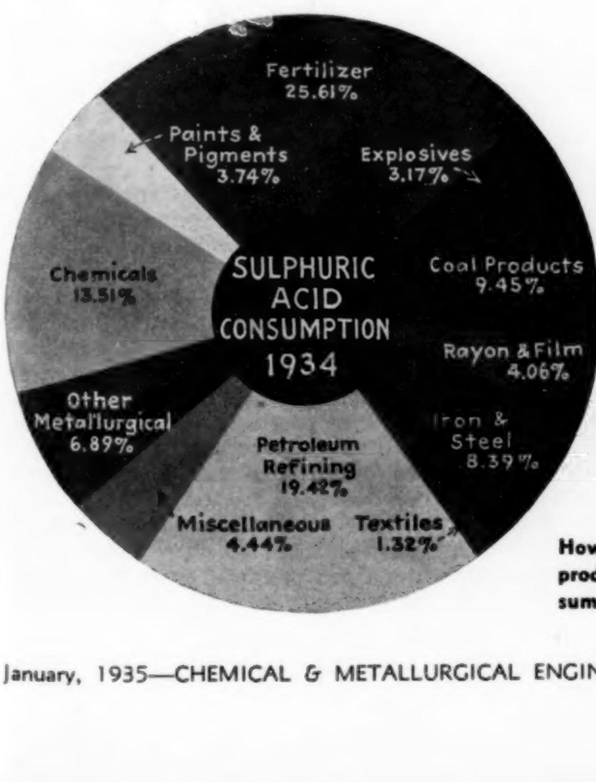
Estimated Distribution of Sulphuric Acid Consumed in the United States

(Basis, 50 deg. Bé.)

Consuming Industries	1932 Short Tons	1933 Short Tons (Revised)	1934 Short Tons
Fertilizer	780,000	1,200,000	1,450,000
Petroleum refining	1,240,000	1,140,000	1,100,000
Chemicals	674,000	725,000	765,000
Coal products	375,000	468,000	535,000
Iron and steel	270,000	390,000	475,000
Other metallurgical	310,000	360,000	390,000
Paints and pigments	160,000	170,000	210,000
Explosives	120,000	140,000	180,000
Rayon and cellulose film	176,000	242,000	230,000
Textiles	75,000	90,000	75,000
Miscellaneous	230,000	223,000	250,000
Totals	4,410,000	5,148,000	5,660,000

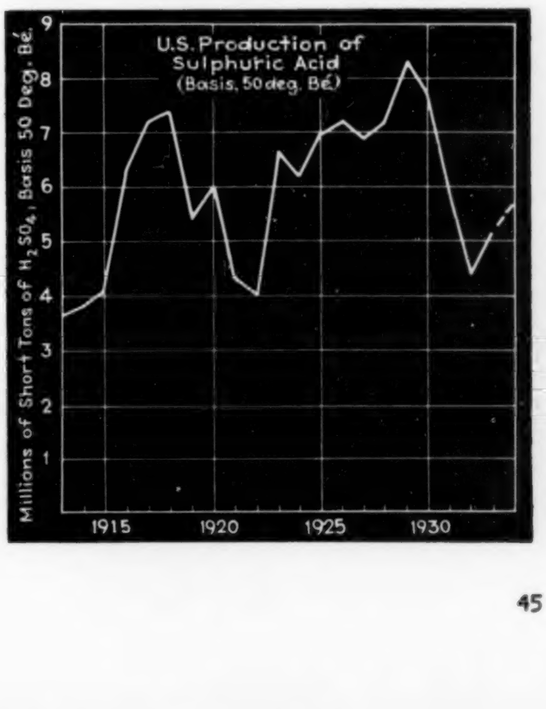
New Developments

Among the technical happenings of the year, two that appear to be of considerable significance are still on paper so far as any commercial development is concerned. We refer to the pressure nitration process for sulphuric acid described by Ernst Berl before the American Institute of Chemical Engineers in November (see *Chem. & Met.*, Nov., 1934, p. 571); and the one-tower nitration system, also useful with pressure according to the Russian scientists who designed it, described in *Chem. & Met.*, Dec., 1934, p. 642. Enormous increases in the rate of acid formation per unit volume of reaction space are claimed for both of these systems. However, it should be pointed out that there is much difference of opinion as to their feasibility. A problem with each type that will be solved with difficulty, if it can



How sulphuric acid production was consumed during 1934

Sulphuric acid production in the United States, 1913-1934



be solved at all, is to dissipate the enormous heat of reaction. Furthermore, the one-tower type bears considerable resemblance to a one-tower chamber system disclosed in U. S. Patent 1,513,903 of 1924, which, as has been pointed out by its owners, has never been successful. Other engineers, however, point to differences which they believe to be of such importance as to make the Russian suggestion an attractive one for investigation.

Another important technical development of the year is a process for turning ferrous sulphate waste into strong sulphuric acid. This has often been suggested as a possibility, but only during the last year has the process been demonstrated in a successful commercial application. The plant in question, built in the Middlewest by the Chemical Construction Corp., is using waste ferrous sulphate in the production of over 100 tons per day of 100 per cent equivalent H_2SO_4. A similar plant of equal size is under construction for the same owner in the East. The process appears to be equally applicable for other ferrous sulphate liquors, such as that from steel pickling. It thus opens a field for the possible prevention of stream pollution by pickle liquor from the steel mills.

In operation of the process, the ferrous sulphate liquor is evaporated to produce a substantially dehydrated material which is then roasted under reducing conditions to yield a strong SO_2 of purity sufficient for use in a vanadium catalyst contact plant. Prior to roasting, as is done in the plant now in operation, green sulphide ores may be mixed with the sulphate to produce additional acid, if this is desired. In addition to SO_2, the roasting yields an iron oxide cinder, part of which is used to neutralize any excess acidity in the feed liquor. Under certain circumstances the cinder may be used for its iron content in blast furnaces, or it is suitable for the production of pigments.

A development to which some consideration is now being given, and of which more may be heard later, is the recovery of values other than sulphuric acid from waste smelter fumes. Two possibilities are in view, the one, to recover liquefied sulphur dioxide, the other, to recover elemental sulphur by one of several apparently suitable processes.

So far as is known, a total of about 390 daily tons of 100 per cent equivalent H_2SO_4 capacity was installed in the United States during the year, including the two plants, referred to above, that were built for operation on waste ferrous sulphate. This is believed to be the first construction that has been undertaken since 1931, with the exception of the Hechenbleikner sludge conversion plant erected during 1932 for W. H. Daugherty & Sons Refining Co.

Progress but No Record for Rayon in 1934

EDITORIAL STAFF

RAYON celebrated its fiftieth anniversary during 1934, not, to be sure, with a new record, as one has almost come to expect for each succeeding annual performance, but with something, very near the record, none the less. Everything considered, this was a remarkable performance in view of several facts, namely, that the year was one of labor unrest, particularly in the textile industry; that the textile industry was in the low year of its two-year cycle; and that the record year, 1933, saw production reach the dizzy peak of about 208,000,000 lb., which was 44 per cent better than the best previous year. All in all, then, the industry cannot but feel satisfaction in a production during 1934 which is expected to have been between 195,000,000 lb., as estimated in September by *Textile World*, and a possible upper level of 200,000,000 lb. Calling it for the sake of conservatism the lower figure, this is still within 6 per cent of the 1933 all-time peak.

As a matter of fact, authorities have not fully agreed as to the 1933 total. *Textile World* clings to its estimate of 208,000,000 lb. as does *Textile Organon* to its slightly lower figure of 207,578,000 lb. The 1933 Census gives as the total 213,497,850 lb., a figure which *Textile Organon*, however, believes contains other cellulose products than rayon.

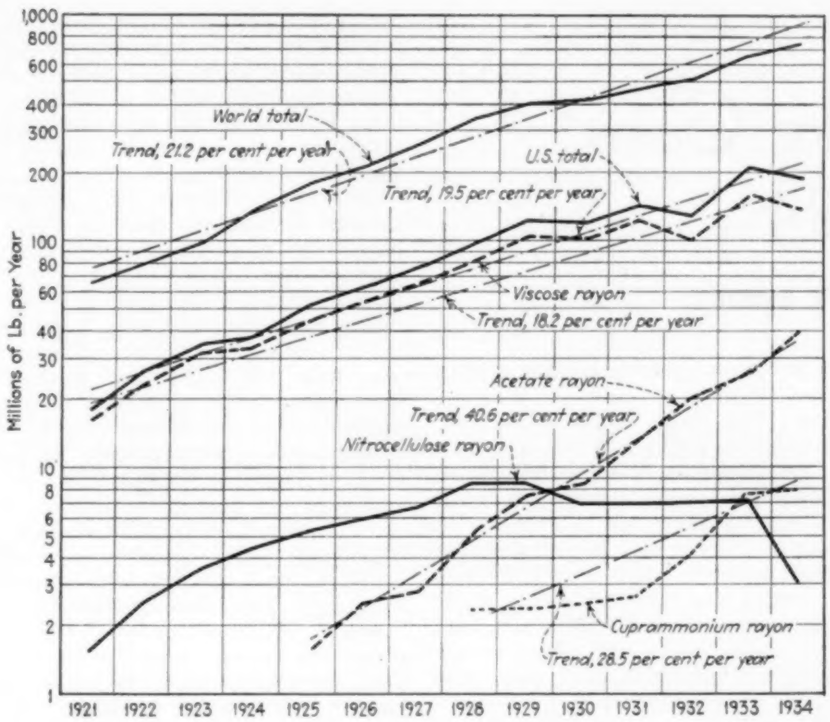
Large Foreign Gain

If the domestic total lagged slightly, textile cycles held no deterrents for world performance. *Textile World* again is authority for the estimate of a world production reaching 744,000,000 lb., an increase of 12.5 per cent over the previous high of 644,555,000 lb. in 1933. All of the principal foreign producing countries increased their outputs considerably, Japan by 49 per cent and Italy, Germany and Great Britain by 13, 15 and 2.4 per cent, respectively. Previous to 1934 Japan had been runner-up to the United States by a small margin over other foreign producers. Within the past year, however, Japanese production was so stepped up as to leave all other foreign nations far behind and to approach within about 60,000,000 lb. of the United States. Japan is reported to be further expanding its producing capacity at a considerable rate and to be particularly interested in forwarding the output of staple fiber.

In the face of increasing pressure from expanded foreign production, however, the domestic industry held its own field without difficulty, thanks largely to our depreciated currency. Imports came closer than ever to the vanishing point, totaling in the neighborhood of 78,000 lb. Exports, on the other hand, continued their upward trend, substantially surpassing the 1,109,588 lb. exported in 1933, and reaching 1,891,161 lb. in the first 10 months of the year. Hence, the record of doubling the preceding year's performance, which has occurred each year since 1931, would appear to have been maintained. Mexico, it is interesting to note, is our best rayon customer, with Cuba a poor second.

Perhaps not very important from a technical standpoint, but at least of a certain sentimental significance to "old-timers" in the industry was the passing of one of the four types of rayon which heretofore has always come in for its estimate along with viscose, acetate and cuprammonium rayons. Late in June Tubize-Chatillon Corp. announced the definite cessation of operation of its nitrocellulose rayon plant at Hopewell, Va. Although the immediate cause of the shut-down was a strike at the Tubize plant which left the equipment in such shape that it would have been difficult to start up again, actually, reports have it that there had for some time been consideration of the abandonment of the process. The corporation has, of course, continued its production of viscose and acetate rayons.

Since none of the major estimating agencies has recently published a breakdown of rayon production, it will be necessary to offer our own, with



World and United States rayon production, 1921 to 1934, with estimated breakdown of United States production by kinds; also trend lines showing average percentage increase per year

considerable mental reservation. At the end of the year it is known that acetate producers were better booked than viscose producers. Also it is known that acetate capacity was materially increased during the year, perhaps to 50,000,000 lb. Hence a reasonable distribution seems to be: viscose, 144,000,000 lb., acetate, 40,000,000 lb., cuprammonium, 8,000,000 lb. and nitrocellulose, 3,000,000 lb. Percentagewise these are, respectively, 73.9, 20.5, 4.1 and 1.5 per cent of the total, compared with 78.3, 14.7, 3.6 and 3.4 per cent in 1933. The significant factor here is the great increase in acetate production and the slow but apparently continuous decrease in the relative importance of viscose. (See the chart above.)

One interesting feature of the current viscose production is the great improvement in fine-spinning technique that has come about recently. Where a few years ago 75 denier was about as fine as viscose producers cared to go, viscose as fine as 50 denier is now being spun. Acetate producers have gone as low as 45 denier, and cuprammonium, as fine as 15 denier. Where a few years ago 2½ deniers per filament was fine for viscose, 1 denier or even slightly less per filament is now possible. This increasing fineness, with its greater covering power, improved handle and better appearance is as much as anything responsible for the apparently limitless popularity of the man-made fibers. The other outstanding factor in this present-day popularity is the continued use of low- and medium-luster yarns which still outsell the bright products in all classes of rayon.

Rayon Production and Imports, 1921-1934

	Thousands of Pounds		
	U S.* Production	U. S.† Imports	World* Production
1921	18,000	3,276	65,000
1922	26,000	2,116	80,000
1923	35,000	3,029	97,000
1924	38,750	1,954	141,000
1925	52,200	5,441	185,000
1926	62,575	9 345	219,000
1927	75,050	15,028	267,000
1928	97,700	12,117	345,000
1929	123,000	15,039	404,000
1930	119,000	6,341	417,000
1931	144,350	1,804	470,000
1932	131,000†	197	599,000
1933	208,000	934	660,000
1934	195,000	78	744,000

*From *Textile World* except as noted.
†From *Textile Organon* except 1934 import which is estimated from 10 months' import figures. Imports to 1930 cover yarns, threads and filaments; since 1930, yarns, singles and plied.

No technical trends of startling importance were evident during the year, unless the commercial production of spun-dyed rayon be such. Competent textile opinion questions whether this development is likely to cut a very wide swath, for the simple reason that the enormous number of shades popular at any one time, and the speed with which popularity shifts, will make it extremely difficult for yarn producers to supply more than a few standard colors, and black. However, the process has brought consternation into the camp of the rayon finishers for the cost of adding dye to the spinning solution at the moment of spinning is negligible compared to the normal dyeing operation, either in the skein or in the piece.

Other developments of the year followed the constant search for economy which has been made necessary by the low prices of recent years. A bucket spinning machine with buckets operating at 15,000 r.p.m. has been brought out. Spinning speeds for viscose are constantly on the increase with 70 meters per minute now said to be the practical limit. Some of the filtering of viscose is now being handled in high-speed centrifuges which are said to handle 1,000 to 1,500 lb. per hour per machine, to reduce the consumption of power, labor and filter materials and to improve the dispersion of the pigments or oils used for delustering.

As has been stated before in these columns, it begins to look as if viscose rayon had finally reached a selling price not far above its distributed cost. For the third year, viscose has shown practically a horizontal trend while acetate appears to be levelling off at a price about 17 per cent above viscose. Although it had been as low as $0.50 at one time in 1933, viscose remained stable at $0.65 from mid 1933 until May, 1934, when it dropped to $0.55 per pound for the 150-denier, 40 filament grade. Just as it began to look as if this price might continue to hold, two increases in late December brought the year-end price to $0.60. Meanwhile, acetate experienced a more varied price history. For some time it had held at $1 per pound until, in late 1933 it dropped to $0.78, and to $0.65 in early 1934. Two acetate producers increased prices by $0.05 last December, while the remainder did not.

Whatever the actual costs may be, however, rayon producers are showing increasing interest in recovery of whatever is recoverable. At least one producer of viscose is reclaiming glauber salt from his spent coagulating bath and selling it. Every major viscose producer, with the exception of one, is now said to be using dialysis for recovery, or to be experimenting actively with the process. Without purification, much spent caustic is sold to soap makers and rubber reclaimers.

Transparent Wrapping Films

Transparent cellulose and cellulose acetate wrapping films enjoyed a good year, with an estimated 11 per cent increase, from about 45,000,000 lb. in 1933 to about 50,000,000 lb. produced in 1934. The most important new application is the wrapping of special breads which has accounted for a considerable increase. The percentage of moisture-proof cellulose film is slowly climbing, accounting for about two-thirds of the cellulose film used during the year. Two new rubber-base wrapping films have recently been developed and may very possibly enter into competition with the older wrapping films during 1935.

Plastics Make Gains In 1934

EDITORIAL STAFF REPORT

CELLULOSE ACETATE is continuing the spectacular climb started a few years ago, but what the peak will be or when it may be reached is difficult to predict. Undoubtedly much of this rise is at the expense of the nitrate. This increase in popularity has occurred notwithstanding the fact that there is a price differential in favor of the nitrate.

Production of Cellulose Acetate

The production of cellulose acetate, other than film and yarn, in 1931, amounted to only about 200,000 lb., while in 1933, 2,482,111 lb. of sheets, rods and tubes of this material were produced, and in the past year over 4,-660,000. It is estimated that 40,000,000 lb. of acetate yarn, and between 1,500,-000 and 2,000,000 lb. of safety film also were produced during 1934.

The price of the acetate has been stationary during the year in spite of the higher prices the manufacturer has had to pay for his principal raw material, cotton, and the higher labor costs caused by N.R.A. It is possible that eventually lower prices may be realized as a result of the increased volume of production, and new processes for the manufacture of acetic anhydride and the recovery of dilute acid.

In the last few months of 1932, manufacturers of safety glass commenced the use of cellulose acetate. Since that time there has been increasing legislation requiring the use of safety glass, not only in the windshields, but throughout the car. Several million pounds of the acetate are now being used annually for this purpose and the quantity is increasing rapidly. However, there is a threat to this rise in the so-called "case hardened" glass.

Automobile hardware of cellulose acetate plastics continues to gain in popularity. In 1935, twelve makers of automobiles, including the three largest selling low-priced cars, will be equipped with this type of plastic. Injection molding offers a promising future for the acetate plastics, for it will enable the production of molded objects from the higher-priced material at prices competitive with the lower-priced resins. Mixed cellulose esters and such esters as benzyl cellulose have made very little progress, probably because of their higher prices.

The vinyl resin, in its fourth year, continued to spread out into new fields of application and somewhat larger volumes were used in such previously established applications as long-playing records, dentures, and in the paint and varnish industry. It is now being used for coating paper for bottle caps where its resistance to acids, alkalis, alcohol, and greases makes it advantageous. Toothbrush handles made of vinyl resin are now on the market.

This resin in any color, containing 40 to 50 per cent filler, sells at 30 to 35c. per lb., depending on volume. The unfilled resin sells at 85c. to $1.25 per lb., according to degree of transparency and volume of order. These prices remained stationary during the past year.

The cast phenolic resins have continued the very rapid expansion that got under way in 1930. It was estimated that 3,000,000 lb. was produced and sold in 1933, and last year the quantity increased to a point approaching the half-million mark. The majority of this tonnage represents the water-white resin produced. About 30 per cent of the resin was consumed in the manufacture of jewelry and novelties, 20 per cent in furniture handles, knobs and trim, 15 per cent in buttons, and the remainder in automobile and electric appliance parts. The average prices have not changed recently. Most of the colors sell at 47.5c. per lb. and the water white at 54c.

Patent Situation

Recently the Marblette Corp. and the Joanite Co. became licensees of the Catalin Corp. of America, and at this time the Catalazuli Manufacturing Co. is being sued for alleged infringement of certain patents involving the manufacture of cast synthetic resins by the Catalin corporation. Other companies which are said to be producing or are about to produce the cast phenolic resins are: Bakelite, DuPont, Celluloid, Fiberloid and Nixon.

Few important changes have occurred in the urea-formaldehyde industry during recent months. The patent situation is no nearer a satisfactory solution than it was on the occasion of our report a year ago. However, since that time the American Cyanamid Co. has obtained complete ownership of the Synthetic Plastics Co. and has absorbed this concern. It is now a division of the parent organization.

In 1933 the Bakelite Corp. became a licensee of Synthetic Plastics and it is said to be preparing to produce urea resins. The Unyte Corp., one of the three producers of this type of resin, has increased its plant facilities. The industry as a whole has had a very satisfactory year, the volume of production holding up to the 5,000,000 lb. mark reached in the preceding year. And although the production costs have increased, prices have remained the same.

During the year a chlorinated rubber base, Tornesit, from which may be formulated paints, emulsions, binders, adhesives, and plastics with chemical resistance, became available in this country. The Hercules Powder Co. imported the material from Europe and at the same time arranged to produce the product with certain refinements at a plant under construction at Parlin, N. J. These refinements include greater uniformity, more rapid rate of solution, lighter color, and less residue than the imported product. As a base for paints to be applied where corrosive elements must be combated, Tornesit has an important use. However, indications are that it will be employed in many industries and for many other purposes than that of a specialty paint material.

Transparent Wrapping

Pliofilm, a transparent wrapping material developed by The Goodyear Tire & Rubber Co., Inc., and now being manufactured and sold by that organization, is found to have several interesting properties as compared to transparent sheets previously available. It is produced from pale crepe rubber and is inherently impervious to moisture without a surface treatment. Because of its chemical and oil resistance, as well as its electrical properties, its use is being investigated in many industrial fields. As a wrapping material, its resistance to tear, its slight elongation prior to rupture, and its unaltered properties during variations in humidity and temperature, combined with those properties previously mentioned, make it a very interesting material for many purposes. This material is being marketed at a price of $0.026 per thousand square inches for large quantities of the .001 in. gage, clear, in rolls, with corresponding prices for other gages, cut-to-size sheets, and colors.

The United States production of nitrocellulose plastics in sheets in 1933 totaled 9,508,222 lb.; in rods, 1,901,812 lb., and in tubes, 506,039 lb., according to the U. S. Tariff Commission. Do-

mestic production of cellulose acetate plastics in sheets, rods and tubes amounted to 2,482,111 lb. Production of synthetic resins in 1933 was as follows:

Derived from	Production	Sales: Pounds	Sales: Value in Dollars
Phenol	25,162,699	21,850,541	5,382,721
Phenol and/or cresol	6,535,081	6,152,258	1,181,949
Phthalic anhydride	9,930,705	3,654,854	673,890
Urea or thiourea ..	3,234,356	2,977,791	1,422,671
All other.....	337,361	280,620	322,431

Imports of pyroxylin and other cellulose esters and ethers, with the exception of cellulose acetate, in 1933 were as follows: sheets, 26,184 lb., value $10,736; tubes, 54,961 lb., $59,325, and "other" 9,657 lb., valued at $9,198. In the same year imports of cellulose acetate in blocks amounted to 984 lb., valued at $1,501. Exports of pyroxylin scrap totaled 1,138,665 lb. valued at $80,301, and outgoing shipments of pyroxylin products in sheets, rods and tubes aggregated 461,492 lb., valued at $315,628.

Progress in Pigment Industry Continues

EDITORIAL STAFF REPORT

TITANIUM DIOXIDE continues to command most of the interest in the white pigment industry; although the volume of sales is comparatively small, the demand is increasing rapidly as is evident from the building program. The established producers are expanding their manufacturing facilities and other pigment interests are entering the field. National Lead Co.'s subsidiary, Titanium Pigment Co., is building another plant for the production of this high covering pigment at Sayreville, N. J. This new plant is nearing completion and will probably have a daily capacity of 30 tons. DuPont's subsidiary, Krebs Pigment & Color Co., is also constructing a second plant for the production of titanium pigments, at a cost of $2,500,000. It will be located at Edgemoor, Del., and will have a capacity in the neighborhood of 50 tons. American Zirconium Corp., jointly owned by the Glidden Co. and Metal & Thermit Corp., has started operation of its plant at St. Helena, near Baltimore. This plant is operated by the Chemical & Pigment Co. and is reported to have a capacity of about 10 tons of pigments.

The titanium pigments are growing in importance in the paint industry because of their high hiding power. They have found a ready market in the pulp and paper industry due to this same property, and they are also being used in the production of rayon, rubber, ceramics and such synthetic resins as the phenolic, urea, and casein. During the past year it is estimated that 32,000 tons of titanium dioxide was produced.

Lead Pigments

As was the case in 1933 the gain in sales of lead pigments during the past year was not uniform. In fact, dry white lead appears to have declined slightly, while the sales of the same pigment in oil increased about 10 per cent. Litharge sales improved 8 per cent over the previous year and the quantity of red lead showed the gratifying gain of approximately 14 per cent.

Both the general improvement in business and the drive of the Federal Government to encourage home owners to improve property have contributed to the increase in the sales of white lead paints. As in the past between 94 and 95 per cent of the output of this white pigment has gone into the manufacture of paints.

The marked improvements in the sales of both litharge and red lead were probably due to the rise in the output of automobiles with the corresponding gain in production of storage batteries, and to the increased activity in the construction industry where red lead is still the most widely used protective paint for iron and steel. Important increases in the consumption of litharge have taken place in petroleum refining, ceramic, rubber, and linoleum industries.

During the year prices for lead pigments, with the exceptions of red lead and litharge, have been steady. Variations in the price of the metal have had their effects on the price of red lead which slumped off early in the year but advanced towards the close to 6¾c. per lb. in car lots for the 95 per cent. Litharge also advanced at the end of the year to 5.20 per lb. in car lots.

The zinc pigments have had an active year. Gains have been registered for both lead free and leaded zinc oxide. Zinc oxides of improved color, brightness, gloss, and levelling are now offered for both interior and exterior paints. For use in the rubber industry fast and slow curing zinc oxides in a wide range of particle sizes have become available. Recently a new oxide has been developed for the ceramic manufacturers. It has high density, low water absorption, and superior color. A new particle size zinc oxide having practically no colloidal particles is available for the paint industry. This type makes possible production of harder paint films which reduce chalking tendencies that have become prevalent during the past four or five years. During the year the Superior Zinc Co. of Bristol, Pa., has come into the zinc oxide picture as a producer of secondary oxide.

Zinc Sulphide Pigments

Zinc sulphide pigments have continued to increase in popularity. The grade of technically pure zinc sulphide has been increased to about 98 per cent sulphide content, with a general improvement in the properties. Considerable interest is being shown in the applications of the higher strength zinc sulphide pigments in the rubber industry. Among the newer variations are zinc sulphide-magnesium silicate and zinc sulphide-titanium dioxide. The year has also witnessed improvements in treated lithopones for paints. There are now available a much broader line of lithopones offering specific properties, especially quick wetting, non-settling, good levelling, and gloss.

Prices for zinc oxides advanced in April, but have remained stationary since that time. Contracts are now being made for the first six months of the new year for lead free zinc oxide at 6½c. per lb. in car load lots, for 35 per cent leaded at 5¾c.

Pigments Sold by U. S. Manufacturers
(Short Tons)

	White Lead dry and in oil		Red Lead	Zinc Oxide	35% Leaded ZnO	Litharge	Lithopone
1927............	32,669	119,026	39,073	151,246	26,064	77,311	176,994
1928............	42,049	111,923	40,497	160,904	24,223	......	200,468
1929............	42,159	104,872	43,021	160,611	27,149	81,868	206,315
1930............	32,548	69,592	32,941	119,142	17,279	72,578	164,065
1931............	30,922	66,446	25,853	95,700	18,577	63,890	151,850
1932............	19,946	46,728	18,880	72,250	14,305	58,096	121,667
1933............	24,628	48,354	21,988	98,542	22,868	61,193	140,831
1934*...........	23,000	56,000	26,000	112,000	25,000	66,000	150,000

*Figures for 1934 are *Chem. & Met's* estimates all others are from the Dept. of Commerce.

Consumption of Solvents Gained In Volume

INCREASED activities on the part of industries which make use of solvents in their manufacturing operations resulted in a broad use of these materials last year and from a purely tonnage standpoint, the solvent industry can report progress as compared with the results of the preceding year.

One of the largest automobile producers continued to make use of synthetic resins in finishing its cars and the increase in the automotive output for the year had but little bearing on the solvents industry. It may be regarded as favorable, however, that other automobile companies have continued as large consumers of lacquer.

The use of resins undoubtedly gained ground but the competition thus created has been felt more in the sale of lacquer than in the sale of solvents. In the case of the latter, it has been more of an inter-industry competition with loss in demand for one solvent largely compensated by a gain in use of another solvent for which preference was shown in that particular type of application.

The use of resins of the glyptal type has produced a call for a type of solvent other than the petroleum naphthas which were so largely employed in protective coatings. The coal tar products at first had the call, but difficulties of odor and in some cases toxicity, and also limited availability, required additional products. Chief among these has been the hydrogenated naphthas. These are petroleum products that have been subjected to the hydrogenation treatment, which gives them the much desired solvent power, as they have the characteristics of both the aromatic and aliphatic hydrocarbons. Their use during the past year has grown to a considerable extent and it is understood that the plans are under way for their development to the extent of several million gallons per annum increase.

It is understood that the consumption of glycerine in these resins amounted to from eight to ten million pounds. Supplies of glycerine have been unusually low and prices have advanced sharply—in fact at times the spot market has been purely nominal in the absence of offerings. This, naturally, had a strengthening effect on the price of synthetics and during the early part of the year a scarcity of phthalic anhydride affected the position of resins.

A great deal of time was spent by manufacturers during the early part of the year endeavoring to formulate a code which might have been a means of eliminating the price cutting in which the industry has been engaged for the past few years. It was found, however, that the solvent industry was so inter-related with other industries servicing the protective coating field that it was not possible to draw a code which would adequately cover the solvent industry without conflicting with other industries which already were operating under codes of different types.

The President signed the Industrial Alcohol Industry Code the latter part of the year so that for the first six months of this year prices of specially denatured alcohols should be somewhat firmer than they have been.

The competitive situation did not improve any over last year and all during the early months of the year big tonnage business was taken at the lowest prices in the history of the solvent industry. However, about the middle of the year the drought, and the AAA program, raised prices on agricultural products sufficiently to cause all producers of solvents from agricultural products to raise prices. There was a nominal raise the early part of August and an additional raise which was actually effective the middle of November.

From the standpoint of litigation, the high spot was a suit instigated by Commercial Solvents against Publicker, which is still pending. The suit has not yet come to trial although at this time Publicker is reported not to be producing butyl alcohol. There has also been some evasion of the Dupont lacquer patents by the use of high viscosity cotton and ketones.

It is expected that the litigation involving the synthetic resins which should come to trial early this year, will clear up the picture as to what the patent limitations are with regard to the production of soluble resins, and it is felt that once this situation is cleared up, that the production as well as the use should broaden and it is to be expected that this will have a definite influence upon the amount of lacquer business replaced with the synthetic resin finishes.

In addition to prospective increases in productive capacities for hydrogenated naphthas, it is understood that one of the principal producers of acetone is modifying its plant so as to produce acetone from ethyl alcohol. Ethyl alcohol also will be used as a raw material for the synthesis of butanol in a plant now under construction in New Jersey.

Ethyl Alcohol

Both production and sale of ethyl alcohol were on a higher scale last year. It is true that in the beverage field there was not the call for alcohol for blending purposes that had been anticipated. On the other hand use of industrial alcohol was more satisfactory because of the improved status of most consuming branches.

The blackstrap market advanced in price during the year due to political troubles in Cuba and to a larger demand for use as cattle food. In the latter part of the year supplies of molasses were so low that one producer is said to have had difficulty in turning out its requirements of alcohol.

The rise in value for molasses and the increased cost of drums had a strengthening effect upon prices for alcohol and so far as specially denatured grades were concerned the price structure throughout the year was firmer than had been the case in the years immediately preceding. The anti-freeze market, however, did not show this stability. Prices for the anti-freeze trade were announced in August but competitive prices were heard shortly after the announcement and considerable business was placed at prices materially under the quotations.

On August 21 the Industrial Alcohol Industry Code was approved. This was supplementary to the Chemical Manufacturing Industry Code. Open price provisions for the alcohol code became effective on November 8. Under this code each member of the industry is required to file lists of all prices, discounts, rebates, allowances, and whether guaranteed against decline. A similar provision has been embodied in the code of the Hardwood Distillation Industry covering sales by members of that industry of methyl alcohol for anti-free purposes.

The new ethyl alcohol plant at the Merrimac Chemical Co., at Everett, Mass. was in operation during the year. The Commercial Solvents Corporation also completely absorbed the Rossville company and is now operating it as a division of the parent corporatoin.

Methanol

Figures for refined methanol produced by wood distillation were not included in the totals as reported monthly by the Bureau of the Census. It is certain, however, that production of all grades of methanol was larger last year than in 1933. For the first ten months of

the year, production of crude methanol reached a total of 3,097,301 gal. as compared with 2,404,284 gal. for the like period of 1933. During the same periods, production of synthetic methanol was 9,442,613 gal. and 6,731,718 gal. respectively.

One of the interesting developments in the methanol market was found in an announcement during the summer to the effect that the use of methanol had been sanctioned in the formula for completely denatured alcohol. This announcement was quickly followed by a statement from the Treasury Department that such authorization would not be given at that time and that the whole matter had been postponed indefinitely. Despite protests from the trade this decision was not changed up to the end of the year.

Although methanol was denied an outlet into consumption as a denaturant for ethyl alcohol, it found an expanding market in the anti-freeze trade both in its own form and in combination with isopropyl alcohol.

Demand for formaldehyde also was on a rising scale in proportion to the increase in production of bakelite-type varnishes and resins.

Acetone

Acetone stood out in the solvent trade last year because of the larger market it enjoyed and because of the strong price position it attained. Leading producers say that 1934 was one of the best, if not the best, years in the history of acetone judged from the volume of sales. Cellulose acetate forged rapidly ahead in the plastic industry and this increase alone made an appreciable change in the distribution of acetone. In the early part of the year large lots of acetone went to the textile trade and at times production was necessary to fill existing orders with no surplus for the spot market.

The position of acetone may be well realized from a study of price fluctuations. In 1933 sales were reported to have been made as low as 6.5c. per lb. and 8c. per lb. was quoted over a considerable part of the year. In contrast the quoted price over the latter part of 1934 was 11c. per lb. and the market was regarded as firm at that figure.

Higher Alcohols and Acetates

The market for butyl alcohol and acetate continued to show an increase over 1933 from a volume standpoint, and as indicated above, price structure for the first half of the year was demoralized. The season started with three producers of normal butyl fighting for the market, but due to litigation and plant difficulties, one producer discontinued operations and another large producer was apparently unable to produce his entire requirements with the result that the main producer was supplying the industry for the better part of the year. The majority of three year contracts held by one large producer expired this year so that the market for 1935 should be in a better condition than it has been for some time.

Ethyl acetate, however, continues to be spotty and prices at the end of the year are more demoralized than they were at the beginning of the year. Part of this unstability can be attributed to the decrease in acetic acid, and part to the determination of a large producer to regain the position that was formerly held for this commodity. The use of isopropyl acetate continued to be a disturbing factor although the quantities actually consumed were relatively insignificant.

The popularity of methyl ethyl ketone increased in the artificial leather trade. Owing to the fact that both producers were short of material, most of the year the volume consumed was not large.

It is reported that the use of the secondary alcohols and acetates has increased and that many of the large lacquer companies are now using them in whole or in part.

Depending upon the general improvement of the business situation, the underlying conditions in the solvent market appear to be healthier than they have been at any time since 1929, and producers have reason to anticipate that they will have a better year from profits, if not volume, than at any time during the past five years.

Grind of Corn Declined 12 Per Cent Last Year

IN AN estimate placing the 1934 corn grind at not more than 66,000,000 bushels, the Corn Industries Research Foundation reported a 12 per cent decline below 1933 in the volume of business of 11 refiners of starches, syrups, sugars and other derivatives of corn. The 1934 estimate compares with a 1933 grind of 75,000,000 bushels.

Reduced demand for the products of the industry, according to the Foundation, was due to competitive conditions, intensified by the increased cost of corn and of other materials used by the industry.

"Imports of duty-free foreign starches continue to enter the United States in heavy quantity," says the Foundation, "and were largely responsible for the lower volume of domestic corn starch used in the textile, chemical, paper, paper box, paste, billboard and other technical fields. The year's corn grind was further reduced by the lower price of sugars, causing partial replacements of sugars and syrups derived from domestic corn."

Alcohol Produced at Industrial Plants and Withdrawals for Denaturing

Fiscal Year	Alcohol Produced, Proof Gal.	Ethyl Alcohol Withdrawn for Denaturation, Proof Gal.	Denatured Alcohol Produced: Completely, Wine Gal.	Denatured Alcohol Produced: Special Wine Gal.	Denatured Alcohol Produced: Total, Wine Gal.
1922	79,906,101.50	59,549,919.6	16,193,523.60	17,152,224.31	33,345,747.91
1923	122,402,849.81	105,819,404.9	27,128,229.54	30,436,913.14	57,565,142.68
1924	135,897,725.83	121,576,196.1	34,602,003.72	33,085,292.04	67,687,295.76
1925	166,165,517.81	148,970,220.9	46,983,969.88	34,824,303.28	81,808,273.16
1926	202,271,670.32	191,670,107.2	65,881,442.43	39,494,443.80	105,375,886.23
1927	184,323,016.97	170,633,436.7	56,093,748.16	39,354,928.48	95,448,676.64
1928	169,149,904.83	159,689,378.2	46,966,601.28	45,451,424.28	92,418,025.56
1929	200,832,051.08	182,778,966.1	52,405,451.92	54,555,006.15	106,960,458.07
1930	191,859,342.42	181,601,420.3	58,141,740.88	47,645,796.84	105,787,537.72
1931	166,014,346.15	149,303,438.5	49,136,200.64	37,172,740.71	86,308,941.35
1932	146,950,812.76	132,578,234.7	34,298,235.54	44,031,281.80	78,329,517.34
1933	115,609,754.29	103,753,240.7	26,254,230.80	35,076,115.90	61,600,346.70
1934	152,108,432.29	127,631,936.46	26,148,808.32	50,551,889.55	76,700,697.87

Production of Crude and Synthetic Methanol

	Production: Crude 1934 Gal.	Production: Crude 1933 Gal.	Production: Synthetic 1934 Gal.	Production: Synthetic 1933 Gal.	Stocks*: Crude 1933	Stocks*: Synthetic 1933
January	360,822	312,481	979,686	352,748	297,163	3,050,641
February	337,983	256,826	690,961	324,527	281,484	2,749,684
March	366,052	268,064	916,872	178,232	288,198	2,262,214
April	342,307	174,201	754,980	425,333	271,914	2,110,901
May	324,063	184,921	897,294	366,015	253,499	1,715,547
June	298,165	179,368	922,551	559,002	317,110	1,444,329
July	256,136	210,709	939,439	561,918	285,619	1,273,512
August	253,612	262,446	951,834	860,314	295,354	1,178,525
September	260,402	243,183	1,079,910	1,460,589	337,174	1,214,105
October	297,759	312,085	1,309,086	1,643,040	406,939	1,124,687
November	309,739	327,337	1,789,970	1,099,249	......	....
December	......	300,303	....	962,185	......	....

*Data for stocks not available after October, 1933

Production and Sales of Certain Coal-tar Crudes

	1925–30 average	1932	1933
Tar produced, 1,000 gal.	630,536	303,812	363,299
Benzol:			
Production, 1,000 gal.	22,257	11,442	19,382
Sales, 1,000 gals.	22,257	11,908	19,723
Sales value, $1,000	4,651	2,148	3,453
Motor benzol:			
Production, 1,000 gal.	96,879	34,227	40,224
Sales, 1,000 gal.	96,879	34,136	38,655
Sales value, $1,000	15,920	4,025	4,380
Naphthalene:			
Production 1,000 gal.	44,762	13,593	30,621
Sales, 1,000 gal.	44,762	12,979	25,253
Sales value, $1,000	581	164	350
Creosote oil:			
Production, 1,000 gal.	95,443	57,842	57,489
Sales, 1,000 gal.	95,443	60,201	58,030
Sales value, $1,000	11,742	5,594	4,779

Fertilizer Code Benefits Both Industry and Consumers

EDITORIAL STAFF

During the past year the fertilizer industry had a reasonably comfortable, moderately profitable season of business. And it secured these advantages with simultaneous delivery of fertilizer to the farmer at figures estimated to be a little lower than paid by the farmer *at the farm* in preceding seasons. Naturally the industry is very happy over this result and enters the new year with a determination to defend its N.R.A. code against all critics.

During the year labor in the industry was benefited. Numbers employed and dollar total of payrolls both increased about 25 per cent above the corresponding figures for the preceding year. The increase was, of course, much more marked during the first six months which compared with a precode interval, than during the last half year which had to be compared with the preceding season of operation under the influence of code wages. (See accompanying chart.)

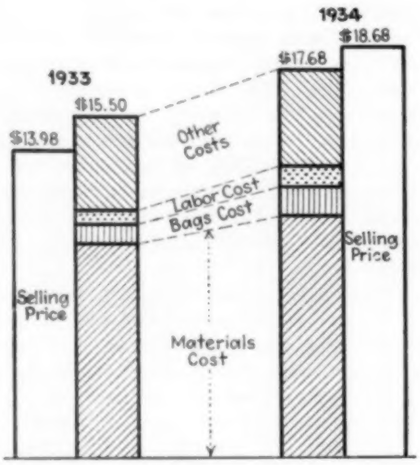
Two Achievements

Two customer benefits are cited by the industry as outstanding achievements of 1934. First, and perhaps the most important technical contribution of the year, was the marked reduction in number of grades authorized. In one state, for example, 165 formulas have been reduced to approximately 30. Moreover, this reduction has been so accomplished as not to preclude the trend to higher concentration fertilizer since fertilizers of 24 per cent or more of plant food are exempt from restriction, provided only that the plant foods are present in a ratio analogous to an approved grade of lower concentration. Furthermore, any customer placing a bona fide order for a special grade can be supplied with this by any manufacturer with whom he wishes to deal without code violation. But offering "special analysis" goods for sale is forbidden.

A second contribution of benefit to agriculture was the regulation which requires quoting of fertilizer prices "delivered at the farm." This has eliminated one factor that in the past prevented the passing on to users of low prices quoted by manufacturers. It gives a means for simplification of the merchandising structure of the industry and prevents exorbitant markup by dealers. In the past during certain seasons when price wars lowered manufacturers' quotations even to the point of operation at a loss, the farmers seldom got the benefit of this since many dealers took the corresponding higher markup and pocketed profits which are not now possible under the new basis of quotations.

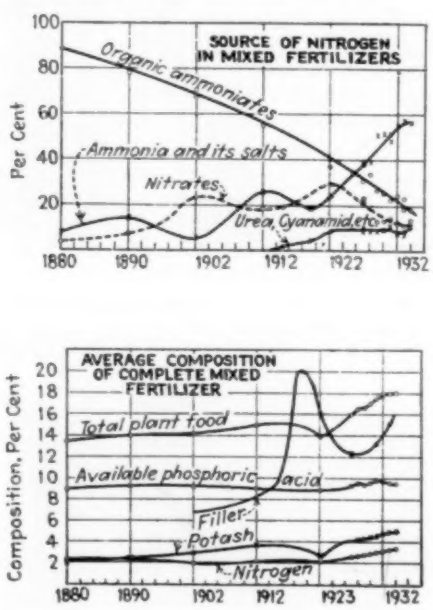
Cooperation Improved

Altogether code operation by fertilizer companies has made for solidarity of the industry and improved cooperation among manufacturers. The better merchandising practices resulting then could accomplish the seemingly impossible result of more profitable manufacture, lower price delivery, and better wages and employment for labor. Open-price filing has been a particularly important part of the code contributing to these ends.

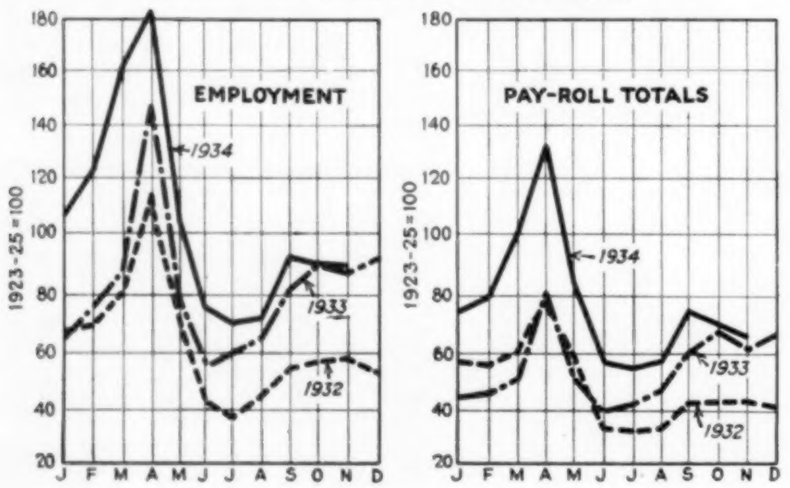


Comparative costs and selling prices for nine typical grades of mixed fertilizer (National Fertilizer Assn.)

What fertilizers contained, 1880-1931 (From data of C. H. Kunsman, U. S. Bureau of Chemistry and Soils)



Both employment and payrolls for 1934 in the fertilizer industry outstripped 1932 and 1933 (National Fertilizer Assn. data)



Two Problems

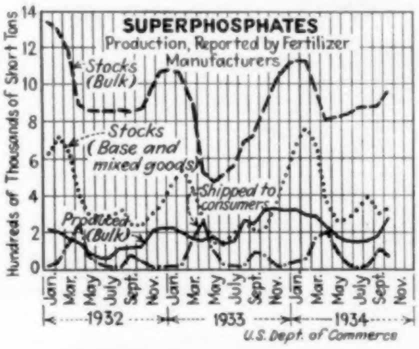
At the end of the year fertilizer men faced two serious problems: First, the threatened competition from T.V.A. with Government subsidy. Second, an uncertainty as to the trend in policy of certain fertilizer-chemical companies.

T.V.A. has already begun manufacture of phosphoric acid and is preparing to make fertilizer on a commercial scale. This procedure is sharply criticized by certain fertilizer spokesmen who believe that T.V.A.'s legitimate function lies only in the experimental development of new processes, not in the field of competitive commercial manufacture. Particularly unfortunate is the feeling that T.V.A., although a Government agency, is not willing to deal frankly or cooperatively with the industry. Clearly, unless there be more opportunity for sincere cooperation, it is not going to be feasible for the industry quickly to take advantage of improved technology as developed by the Authority. Steps are being taken now within the industry which, it is hoped, may correct the misunderstandings which prevail.

Chemical manufacturers, as well as fertilizer companies, are presumably concerned with the proposal of commercial manufacture of chemicals at Muscle Shoals by T.V.A. Work there might easily affect the total market for sulphur and sulphuric acid as much as the fertilizer business, and the extension of chemical manufacturing into other fields is always a dangerous possibility when any precedent-making enterprise of this sort goes on with an ill-considered or lightly considered program. The element of secrecy which has surrounded some parts of the T.V.A. work perhaps contributes as much to the disturbed peace of mind as anything actually being done, but the uncertainty among industrialists is both real and serious.

If T.V.A. should manufacture fertilizers or fertilizer chemicals, there will still remain the question as to the proper means for disposal or marketing. Perhaps least objectionable of all proposals is that the Government should itself use all of the fertilizer chemicals and mixed fertilizer produced either for experiments in agronomy or for Government-owned erosion-control projects, which otherwise probably could not go forward. Thus the two outlets would either be harmless in the competitive sense, or might actually in the end stimulate commercial fertilizer sales. That T.V.A. should sell fertilizer commercially, even limiting the sales to agricultural cooperatives, is not an idea that finds any acceptance in the process industries.

For ten years or more, Dr. Charles J. Brand has been proposing that there should be founded a Plant Food Institute. It has been his idea that such an agency should represent as wide a variety of persons interested in fertilizer chemicals, producers, marketers, or users, as can work together for the betterment of the scientific and economic knowledge underlying the business. Now, it is reported, some of the commercial groups wish to organize such an Institute to become a spokesman, not of all parties, but primarily of chemical manufacturers. This idea disturbs fertilizer men who feel that real progress can only come through joint action. Such cooperative development of the idea is still hoped for. If an Institute can be founded with all parties adequately and effectively participating, the benefit in producer-consumer relations may be very marked in the field of fertilizer chemicals (as distinct from fertilizers themselves).



Superphosphates, 1932-1934

U. S. Imports and Exports of Certain Fertilizers and Fertilizer Materials

(January-November Totals for All Countries in Long Tons)

IMPORTS

	1934	1933	1932
Ammonium sulphate	1[illegible]1,163	328,453	292,086
Calcium cyanamide	74,822	53,456	57,861
Sodium nitrate	276,432	99,358	50,471
Ammonium phosphates	9,343	3,664	*
Total nitrogenous materials	720,471	647,330	483,124
Total phosphate materials	29,976	58,964	62,364
Total potash materials	370,150	353,409	249,983
Grand Total	1,169,159	1,125,696	842,920

*Not previously stated separately.

EXPORTS

	1934	1933	1932
Ammonium sulphate	24,675	12,036	14,693
Total nitrogenous materials	186,589	99,935	172,450
Superphosphates	55,604	31,016	20,867
Total phosphate materials	951,483	807,929	577,712
Grand Total	1,179,846	946,364	767,514

Pacific Coast Process Industries in 1934

By PAUL D. V. MANNING

Pacific Coast Editor

DURING 1934, Pacific Coast process industries carried on some interesting activities and developments, mainly limited, however, to already existing plants. Production of some new products was begun and a few new plants were built or are at present time being built, but the year cannot be said to have been at all spectacular in this regard.

American Potash & Chemical Corporation at Trona, California, is now producing soda ash and sodium sulphate from Searles Lake brines. At Owens Lake (also a California desert lake), activity has narrowed to two producers, Pacific Alkali Company and Natural Soda Products Company which has become a subsidiary of an Eastern alkali manufacturer.

In Southern California, Mitchell-Hughes Processes, Inc., is building a large pigment plant for the manufacture of zinc and lead pigments. Low grade zinc and lead ores will be processed.

The Union Oil Company has established a new process for the production of a high grade lubricating oil free from wax, asphalt, free carbon, etc., using California crudes as raw materials. The development of this process which uses liquid propane as a solvent, was due to research work carried on by Dr. Ulric B. Bray and C. E. Swift. The plant is now in operation at Oleum, California.

Standard Oil Company of California, has installed new equipment at its Richmond, California, plant, using phenol as a solvent for unsaturated compounds in oil refining.

Great Western Electrochemical Company has begun production of hydrochloric acid by chlorination of natural gas. This company is also now making sal-ammoniac, zinc ammonium chloride and carbon tetrachloride in addition to previously described products.

Shell Chemical Company has increased its production of fixed nitrogen, mostly as ammonium sulphate. Considerable anhydrous ammonia now manufactured by this organization is being used as a fertilizer by direct addition to irrigation waters.

Larger Consumption of Nitrogen Last Year

GENERAL improvement of agricultural conditions throughout the world occasioned larger use of nitrogen last year than in any year since the peak requirements of 1929-1930. World estimates prepared by British Sulphate of Ammonia Federation indicate that 1933-1934 consumption was almost exactly the same as in 1928-1929 and within 5 per cent of the all-time peak.

"Manufactured" nitrogen was produced and consumed last year in larger quantities than ever before, for the second successive year setting a world record, with Chilean nitrate still at a very low level, though higher than in the two years immediately preceding. Furthermore, the synthetic nitrogen other than sulphate of ammonia also made an all-time record; and production of synthetic sulphate was only a trifle lower than the preceding record year.

The frequently repeated statement that Chilean nitrate experienced a great comeback in 1934 is true but misleading. In the last complete fertilizer year the consumption of natural Chilean nitrate in the United States was nearly three times that two years before but only one-third that in the more nearly normal two years beginning 1927 and 1928.

Yet recent reports show the industry to be improving. In the last months of 1931, average monthly production of nitrate was about 95,000 metric tons. In December, 1932, the output had declined to 32,000 tons. By December, 1933, it had risen to 41,000 tons. Last year production was still upward with about 99,000 tons produced in November.

Despite the marked increase in ammonium sulphate production in the United States from byproduct ovens, this country continues a net importer of that important fertilizer constituent. Heavy inroads into fertilizer nitrogen of this type have been made by anhydrous ammonia and ammonia-urea mixtures used for ammoniation of superphosphate, but these important trends have hardly more than compensated for the constant increase in the nitrogen content of mixed fertilizers. Furthermore, the decline in consumption of organic ammoniates and nitrates for mixed fertilizers, a change which has been going on for more than ten years, has made room for all domestic ammonium sulphate production and large quantities of synthetic ammonia, as well as the net quantities imported. There is every reason to believe that this trend will continue longer, perhaps with greatest acceleration in the case of anhydrous ammonia and urea-ammonia mixtures.

World Production and Consumption of Fixed Nitrogen

The following figures are from the annual report of the British Sulphate of Ammonia Federation, Limited. They are offered as fair estimates but strict accuracy is not claimed for them.

Production and Consumption of Pure Nitrogen for the Fertilizer Years

(In metric tons)

	1926/27	1927/28	1928/29	1929/30	1930/31	1931/32	1932/33	1933/34
Production:								
Sulphate of Ammonia								
Byproduct	328,200	368,000	376,000	424,440	359,594	301,655	257,719	305,953
Synthetic	300,000	367,000	485,000	442,100	349,087	522,207	559,984	540,279
	628,200	735,000	861,000	866,540	708,681	823,862	817,703	846,232
Cyanamide	180,000	198,000	192,000	263,800	200,932	134,604	168,495	192,442
Nitrate of Lime	81,000	105,000	136,000	130,500	110,585	78,939	118,241	105,997
Other forms of Nitrogen*.								
Synthetic	183,400	242,000	383,000	427,300	393,150	347,842	462,060	511,865
Byproduct	50,300	54,000	51,000	51,400	30,940	29,970	39,560	45,040
Chile Nitrate	199,600	390,000	490,000	464,000	250,000	170,000	70,800	85,200
Total production	1,322,500	1,724,000	2,113,000	2,203,540	1,694,288	1,585,217	1,676,859	1,786,776
Percentage Increase or Decrease	*−0.8%*	*+30.4%*	*+22.6%*	*+4.3%*	*−23.1%*	*−6.5%*	*+5.8%*	*+6.55%*
Consumption:								
Manufactured Nitrogen	1,091,177	1,249,669	1,452,630	1,586,904	1,377,005	1,417,126	1,619,705	1,700,907
Chile Nitrate	275,158	392,722	419,450	363,893	244,300	138,208	127,242	161,199
Total consumption	1,366,335	1,642,391	1,872,080	1,950,797	1,621,305	1,555,334	1,746,947	1,862,106
Percentage Increase or Decrease	*+8.6%*	*+20.2%*	*+14.0%*	*+4.2%*	*−16.9%*	*−4.1%*	*+12.3%*	*+6.6%*
Agricultural consumption, about	1,190,000	1,460,000	1,670,000	1,750,000	1,455,000	1,412,000	1,586,000	1,663,000
Percentage Increase or Decrease	*+6.5%*	*+22.7%*	*+14.4%*	*+4.8%*	*−16.9%*	*−3.0%*	*+12.3%*	*+4.85%*

*Including nitrogen products used for industrial purposes (except Chile nitrate) and ammonia in mixed fertilizers.

Note.—Fertilizers are included in these tables under the final form as sold, so that, for example, cyanamide if converted into sulphate of ammonia is included under synthetic sulphate of ammonia, or, if into ammophos, is included under other synthetic nitrogen.

Nitrogen Consumption Classified by Countries and Products

(In metric tons)

Continent	Fertilizer Year	Ammonium Sulphate and Ammonia for Mixed Fertilizers	Chile Nitrate	Calcium Cyanamide	Other Synthetic Nitrogen Fertilizers	Nitrogen Products for Industrial Purposes (Excl. Chile Nitrate)	Total
Europe	1926/27	386,384	118,075	155,812	189,288	59,770	909,329
	1927/28	409,474	176,225	163,414	219,077	61,446	1 029,636
	1928/29	416,860	201,010	173,370	274,790	85,630	1,151,660
	1929/30	429,101	187,357	168,465	300,801	84,852	1,170,576
	1930/31	369,459	141,000	138,396	278,191	67,426	994,472
	1931/32	441,363	90,544	121,544	290,147	71,043	1,014,641
	1932/33	433,011	69,525	134,131	347,080	76,852	1,060,599
	1933/34	409,303	78,022	150,421	386,794	83,513	1,108,053
Africa	1926/27	7,847	28,115	180	5,141	50	41,333
	1927/28	8,653	33,255	566	6,597	100	49,171
	1928/29	9,330	32,030	330	9,070	270	51,030
	1929/30	10,460	36,176	680	13,057	275	60,648
	1930/31	8,727	30,400	654	13,085	505	53,371
	1931/32	10,947	23,407	120	22,506	4,188	61,168
	1932/33	16,085	9,170	194	28,997	6,318	60,764
	1933/34	13,379	21,679	153	25,118	6,608	66,937
Asia	1926/27	136,486	9,263	7,309	302	2,500	155,860
	1927/28	161,723	13,090	19,708	2,374	4,600	201,495
	1928/29	196,140	16,860	19,380	7,110	5,680	245,170
	1929/30	217,381	9,504	22,770	15,480	5,074	270,209
	1930/31	200,219	5,900	28,467	8,652	6,002	249,240
	1931/32	211,639	3,258	12,450	11,698	10,164	249,209
	1932/33	269,069	3,159	31,551	17,370	10,024	331,173
	1933/34	254,435	3,532	29,859	16,322	19,528	323,676
Oceania (including Hawaii)	1926/27	7,156	9,269	.....	482	400	17,307
	1927/28	7,390	9,340	.....	1,001	400	18,131
	1928/29	9,730	10,400	.....	950	400	21,480
	1929/30	14,934	13,222	20	2,108	1,100	31,384
	1930/31	15,149	6,000	6	3,345	934	25,434
	1931/32	14,719	4,852	.....	4,291	850	24,712
	1932/33	17,815	595	.....	3,922	1,244	23,576
	1933/34	23,557	2,466	.....	3,443	1,344	30,810
America	1926/27	53,399	110,436	16,108	12,660	49,903	242,506
	1927/28	84,992	160,812	18,680	24,324	55,150	343,958
	1928/29	95,600	159,150	24,400	58,290	65,300	402,740
	1929/30	139,880	117,634	26,000	68,799	65.667	417,980
	1930/31	129,400	61,000	13,765	39,978	54,645	298,788
	1931/32	113,458	16,147	10,554	14,480	50,965	205,604
	1932/33	132,656	44,793	10,417	21,887	61,082	270,835
	1933/34	131,517	55,500	14,100	50,775	80,738	332,630
World	1926/27	591,272	275,158	179,409	207,873	112,623	1,366,335
	1927/28	672,232	392,722	202,368	253,373	121,696	1,642,391
	1928/29	727,660	419,450	217,480	350,210	157,280	1,872,080
	1929/30	811,756	363,893	217,935	400,245	156,968	1,950,797
	1930/31	722,954	244,300	181,288	343,251	129,512	1,621,305
	1931/32	792,126	138,208	144,668	343,122	137,210	1,555,334
	1932/33	868,636	127,242	176,293	419,256	155,520	1,746,947
	1933/34	832,191	161,199	194,533	482,452	191.731	1,862,106

Larger Production of Natural Sodas

PRODUCTION of sodium compounds, not including common salt, from natural salines and brines in the United States in 1933, as indicated by sales or shipments by producers, amounted to 305,047 short tons, valued at $4,599,912. These figures which include the output of sodium carbonate (soda ash and trona), sodium bicarbonate, sodium sulphate (salt cake and Glauber's salt), and sodium borate (borax and kernite), show an increase in both quantity and value compared with the output in 1932 (269,496 short tons, valued at $4,122,238).

The sodium carbonates reported in 1933 were from California and amounted to 70,461 short tons, valued at $918,295, compared with 55,377 tons, valued at $888,052 in 1932, an increase of 27 per cent in quantity and 3 per cent in value. They were produced in California from Owens Lake, Inyo County, by the Pacific Alkali Co. (Pacific Mutual Bldg., Los Angeles, Calif.), Bartlett (soda ash); and the Natural Soda Products Co. (650 South Spring St., Los Angeles, Calif.), Keeler (soda ash, sodium bicarbonate, and trona); and from Searles Lake, San Bernardino County, by the West End Chemical Co. (Syndicate Bldg., Oakland, Calif.), Westend (soda ash).

The sodium sulphate (salt cake and Glauber's salt) shipped amounted to 46,539 tons, valued at $245,240 in 1933, compared with 32,204 tons, valued at $210,242 in 1932. The production of salt cake was from Camp Verde, Ariz., by the Arizona Chemical Co.; by the Rhodes Alkali & Chemical Corp., near Mina, Nev.; and by the Ozark Chemical Co., near Monahans, Texas. Hydrated sodium sulphate (Glauber's salt) was produced near Casper, Wyoming, by W. E. Pratt, and by the Columbian Hog & Cattle Powder Co. The Iowa Soda Products Co. mined Glauber's salt near Rawlins, Wyoming, and shipped to Council Bluffs, Iowa, for refining. Sodium sulphate was also produced experimentally near Twentynine Palms, Calif., by the Chemical Mines Co., and a plant for the manufacture of sodium sulphate was under construction near Saltair, Utah, by the Salt Lake Sodium Products Co. but no product was shipped.

Natural Sodium Compounds Produced in the United States, 1929-1933

	Natural sodium compounds: Carbonates[1] Short tons	Value	Sulphates[2] Short tons	Value	Borates[3] Short tons	Value	Total Short tons	Value
1929	102,930	$1,916,632	7,540	$41,199	164,720	$4,149,835	275,190	$6,107,666
1930	90,300	1,585,756	32,630	206,323	174,510	5,105,425	297,440	6,897,504
1931	78,530	1,223,544	32,510	198,132	178,550	4,931,295	289,590	6,352,971
1932	55,377	888,052	32,204	210,342	181,915	3,023,844	269,496	4,122,238
1933	70,461	918,295	46,539	245,240	188,047	3,436,377	305,047	4,599,912

[1]Soda ash, bicarbonate and trona; 1930 also includes sal soda.
[2]Salt cake and Glauber's salt.
[3]1929-1930, borax and kernite; 1931-1933, borax, kernite, and boric acid calculated as borax.

Consuming Trades Absorb Glycerine Stocks

FOR THE greater part of last year the market has been featured by the sold-up position of producers. In the first place, production was on a reduced scale with soap makers showing a decided shift from the use of vegetable oils in favor of tallow and other animal fats. This naturally had the effect of cutting down the output of glycerine.

On the other hand, with the exception of the anti-freeze trade for which supplies of glycerine were not available, the different consuming industries were increasing their demand for supplies. Glyptal resin manufacture was on an enlarged scale and ester gum production also called for expanding stocks of glycerine. The result was that production was readily absorbed and very little, if any, supplies were available for spot trading. Quotations in the spot market, therefore, were little better than nominal at times and sales are said to have been made as high as 3c. per lb. above the openly quoted price. To add to the anomaly of the situation export buying at times was quite active and good sized lots are reported to have been shipped out of the country in the earlier part of the year.

Imports of glycerine reached a larger total than in any recent year although some of the foreign markets were reported to have received less than normal amounts.

Imports of crude and refined glycerine from 1924 to date are given in the following table, the figures for 1934 representing arrivals for the first ten months of the year:

	Imports of Glycerine: Crude Lb.	Refined Lb.
1924	13,600,000	1,500,000
1925	18,600,000	2,000,000
1926	27,563,962	10,880,454
1927	14,784,615	8,268,071
1928	4,915,651	4,210,467
1929	14,601,736	5,493,471
1930	10,906,426	3,177,479
1931	9,951,473	1,975,970
1932	5,184,411	2,333,606
1933	6,204,636	2,777,918
1934	13,804,770	1,805,758

In order to conserve the national supply of imported oils and fats the German soap industry has been using 20 per cent of sodium silicate in the manufacture of all soaps and cleansing powders, except toilet soaps. The use of silicate on such a large scale in soap manufacture has resulted in a marked lessening in processing of oils and fats, with a consequent heavy decrease in output of glycerine.

Glycerine producers recently increased their price to 70 marks per 100 kilos but this had little practical significance since it was impossible to secure goods at this figure and even contracts calling for future deliveries were not being booked.

Income Returns of Manufacturing Industries for 1933

Industrial groups	Total number of returns	Returns showing net income: Number	Gross income	Net income	Income tax	Returns showing no net income: Number	Gross income	Deficit	Number of returns showing no income data—inactive corporations
Manufacturing:									
Food products, including beverages	14,850	4,878	4,960,046,233	296,852,785	42,296,778	9,034	1,437,617,559	80,859,385	938
Tobacco products	389	117	830,752,975	65,068,334	8,980,417	251	37,043,523	3,135,968	21
Textiles and their products	13,798	5,341	2,893,076,444	183,690,721	26,194,682	8,114	1,203,137,516	83,954,550	343
Leather and its manufactures	2,227	924	692,819,688	45,781,430	6,463,814	1,239	196,509,383	16,974,781	64
Rubber products	538	209	298,103,259	13,018,683	1,873,489	302	229,881,834	8,009,429	27
Forest products	6,475	1,563	384,574,121	21,277,891	3,049,403	4,617	498,216,231	75,888,048	295
Paper, pulp, and products	2,049	950	649,055,811	45,830,732	6,451,587	1,042	319,868,378	29,295,777	57
Printing, publishing, and allied industries	11,348	2,577	782,225,034	66,076,209	9,251,500	8,359	567,213,465	50,267,054	412
Chemicals and allied products	7,111	2,262	3,026,447,657	225,247,534	31,971,863	4,377	920,339,447	127,328,436	472
Stone, clay, and glass products	3,934	612	371,370,639	33,503,517	4,737,918	3,058	268,141,356	52,010,715	264
Metal and its products	17,994	4,021	2,535,138,226	169,067,216	23,862,526	13,124	2,940,772,716	366,900,226	849
Manufacturing not elsewhere classified	6,720	1,415	497,678,044	45,260,950	6,566,477	4,484	417,195,242	71,550,802	821
Total manufacturing	87,433	24,869	17,921,288,131	1,210,676,002	171,700,454	58,001	9,035,936,650	966,175,171	4,563

Spotty Conditions Prevailed in Naval Stores Market

TRADING in naval stores failed to come up to expectations last year. This is true both from the standpoint of values and from the standpoint of volume of sales. Receipts of gum turpentine and gum rosin at the principal southern ports fell below the totals in the preceding year, and export trade—which is highly important in this industry—failed to measure up to the standards of the preceding year. Some of the domestic consuming trades took on larger stocks of both rosin and turpentine than they had done in 1933 and the extent of domestic distribution presented, perhaps, the brightest phase of the year's trading.

Wood rosin and wood turpentine made a relatively fine showing and apparently not only captured a larger part of the home markets but also improved its position by securing a larger percentage of the export trade.

Production of wood rosin in the first ten months of 1934 amounted to 464,208 bbl. as against 389,727 bbl. in the like period of 1933. In the same period production of wood turpentine was 75,498 bbl. compared with 61,524 bbl. in the 1933 ten-month period. Hence substantial gains were recorded in that branch of the industry.

These products also made a favorable showing in the export trade, making gains in that direction while the gum products were falling behind last year's totals. Exports of wood rosin in Jan.-Oct., 1934, were 187,115 bbl. against 180,087 bbl. in 1933 and exports of wood turpentine were 711,507 gal. and 684,146 gal. respectively. Exports of gum rosin in the same periods were 644,944 bbl. and 832,717 bbl. while exports of gum turpentine were 8,677,155 gal. and 11,276,880 gal., thus representing a decline of about 23 per cent in each case.

The naval stores trade entered the year under a marketing agreement sanctioned by the government. In the early part of the year the control committee set up a marketing quota based on a reduction of 10 per cent from the estimated production for the season.

The license for the wood naval stores industry establishes a system of marketing quotas, which, during the period from April 2, 1934, to Dec. 31, 1934, shall not exceed 71,000 bbl. of wood turpentine and 399,000 bbl. of wood rosin. This quota is apportioned among the various branches of the processors as follows: 57,000 bbl. of wood turpentine and 399,000 bbl. of wood rosin to the processors of steam distilled wood turpentine and wood rosin; 9,000 bbl. of wood turpentine to the processors of this product by the sulphate method, in which it is a byproduct of the manufacture of paper, and 5,000 bbl. of wood turpentine to the processors of this product by the method of destructive distillation.

An amended license providing for a new method of allocation of gum turpentine and gum rosin production to processors was signed on Dec. 27 by Secretary of Agriculture Wallace to become effective on Dec. 31.

The amended license provides that allocations shall be made to old processors by taking the average of the quotas allotted in 1934, plus the production of 1933. The original license provided for the proration of quotas predicated on the use of percentages based on averages of the production in the applicable years 1930-33, inclusive. The effect of this change is that it gives greater weight to the 1933 production.

An estimate by the French Forestry Service placed the total annual production of crude gum in France at approximately 350,000 barrels. Of this quantity it was estimated that the crude gum produces on the average about 20 per cent of gum spirits of turpentine and 70 per cent of dry products (various grades of rosin), and about 10 per cent of waste matter. Based on these percentages the annual yield is about 7,495,029 gallons of turpentine and 83,300 metric tons of rosin. French consumption of naval stores is about 54 per cent of turpentine and 34 per cent of rosin of the total French production.

The new German policy of shifting import business to countries with which it has a favorable balance of trade is resulting in marked declines in imports of American turpentine and rosin, according to reports from Washington. Normally, Germany buys from 65 to 75 per cent or more of her requirements of these products from the United States but since the middle of 1934 the percentage has declined rapidly as a result of the transfer of purchases to European countries.

During the first ten months of 1933 Germany purchased 39,800 metric tons of American gum rosin, or about 79 per cent of its imports of this commodity from all countries. During the first ten months of 1934 imports of American rosin had declined to 30,236 tons, or only 49 per cent of the total from all sources. Germany's imports of American turpentine during the first ten months of 1934 amounted to only 7,700 metric tons, or 40 per cent of total imports from all sources, compared with 12,145 tons, or 65 per cent, for the first ten months of 1933.

Production of Wood Rosin and Turpentine

	Wood Rosin 500-lb. bbl.		Wood Turpentine 50-gal. bbl.	
	1934	1933	1934	1933
Jan.	46,850	31,188	7,970	4,975
Feb.	46,016	25,583	7,892	4,175
Mar.	43,753	26,597	7,279	4,255
April	45,454	24,926	7,729	3,831
May	43,243	31,045	7,050	5,028
June	38,554	35,163	6,393	5,514
July	37,037	41,033	5,547	6,516
Aug.	38,537	42,961	5,904	6,779
Sept.	43,095	43,213	6,798	6,642
Oct.	39,785	44,821	6,288	6,929
Nov.	41,884	43,197	6,548	6,880
	464,208	389,727	75,498	61,524

Receipts of Gum Rosin and Turpentine at Three Southern Ports

	Gum Rosin		Gum Turpentine	
	1934 bbl.	1933 bbl.	1934 bbl.	1933 bbl.
Jan.	39,219	35,064	4,985	6,283
Feb.	32,640	30,639	2,639	2,826
Mar.	59,443	35,796	8,721	6,710
April	69,496	63,372	17,315	18,176
May	97,905	110,450	24,658	32,359
June	102,417	121,946	27,614	35,549
July	116,019	123,977	31,148	35,265
Aug.	109,234	113,107	32,473	33,237
Sept.	89,289	91,251	26,856	26,911
Oct.	92,482	90,474	25,161	24,479
	808,144	816,076	201,570	221,795

Volume 42—**Chemical & Metallurgical Engineering**—Number 1

Chemical & Metallurgical Engineering is the successor to *Metallurgical & Chemical Engineering*, which in turn was a consolidation of *Electrochemical & Metallurgical Industry* and *Iron & Steel Magazine*, effected in July, 1906.

The magazine was originally founded as *Electrochemical Industry*, in September, 1902, and was published monthly under the editorial direction of Dr. E. F. Roeber. It continued under that title until January, 1905, when it was changed to *Electrochemical & Metallurgical Industry*. In July, 1906, the consolidation was made with *Iron & Steel Magazine*, which had been founded eight years previously by Dr. Albert Sauveur. In January, 1910, the title was changed to *Metallurgical & Chemical Engineering*, and semi-monthly publication was begun Sept. 1, 1915. On July 1, 1918, the present title was assumed and weekly publication was begun Oct. 1, 1919. Monthly publication was resumed in March, 1925.

Dr. E. F. Roeber was editor of the paper from the time it was founded until his death on Oct. 17, 1917. After a brief interim he was succeeded by H. C. Parmelee. Ten years later, Nov. 1, 1928, Dr. Parmelee was elected vice-president of the McGraw-Hill Publishing Co., and was succeeded in the editorship of *Chemical & Metallurgical Engineering* by Sidney D. Kirkpatrick.

The editorial staff of the magazine comprises: S. D. Kirkpatrick, editor; James A. Lee, managing editor; H. M. Batters, market editor; T. R. Olive, associate editor and R. S. McBride and Paul D. V. Manning, special editorial representatives in Washington, D. C., and on the Pacific Coast, respectively.

[Published each year as a matter of record.]

Vegetable Oil Production Down Consumption Increased

OWING to the curtailment in cotton production last year, there was a drop in the quantity of cottonseed available for crushing purposes and as a consequence, a marked falling off was reported for production of cottonseed oil. Coconut oil also was produced in smaller volume and the total for all vegetable oil production made an unfavorable showing as compared with the quantity turned out in 1933.

Soap production which had been on a large scale prior to the operation of the code, slowed up somewhat thereafter but the total production for the year was reported as larger than that for 1933. It is apparent, however, that the use of vegetable oils for soapmaking was cut into rather heavily because of the low prices which prevailed in the early part of the year for tallow and other animal fats. As a result the figures for the first three-quarters of the year show an increase in factory consumption of animal fats of nearly 6 per cent while consumption of vegetable oils was slightly below that of the preceding year.

Sales of paint, varnish, and lacquer were considerably higher than in 1933 and this condition found a counterpart in a larger consumption of linseed and china wood oils. Production of tung, or china wood oil, in this country is still too small to be a factor but the Department of Commerce is authority for the statement that approximately 50,000 acres are now planted in several gulf coast states, including Florida with 16,600 acres; Georgia, 3,500; Louisiana, 2,500; Mississippi, 27,000; and Texas, 400 acres, according to a recent survey.

Experiments with tung tree cultivation are being conducted in several parts of the British Empire, particularly in Burma, Australia, New Zealand, and the Union of South Africa. Argentina, Brazil, and Paraguay are some of the countries of South America in which the tung tree is being cultivated, while Russia with 900 acres now under cultivation, plans to extend acreage to 36,000 by 1937 in an effort to become self-sufficient in this important raw material.

The decline in production of crude vegetable oils naturally resulted in a corresponding drop in the amount of refined oils produced as the refining of imported oils was not important although production of refined coconut oil was a little larger than production of the crude oil.

The most important development in the oil market is connected with the sharp rise in the average price level. In January, *Chem. & Met's* weighted index number for vegetable oils and animal fats was 51.38. In December the number had risen to 83.32. Government control of cotton and hog production was instrumental in reducing the cotton crop which in turn cut down oil production and the smaller supply finally ended in a rising price trend for the oil. In like manner the reduced marketing of hogs brought about a decline in lard production and the rise in lard prices actually was the most important single factor in pulling up prices for the oil and fats market in general.

Production of flaxseed in the United States is estimated at 5,198,000 bushels, which is the lowest on record, and approximately 25 per cent less than last year's small crop of 6,806,000 bushels. Although reduced acreage is partly responsible for the decrease, drought and extreme heat in a large part of the important flaxseed producing belt, coupled with frosts late in August, are the main contributing factors. Weather conditions in Canada were very similar, being especially unfavorable to the growing crop. Flaxseed production in Canada has been revised downward, and is now estimated at 955,000 bushels. Although this is larger than last years' very small crop of 632,000 bushels, it is still far below average.

The Argentine crop has come along well and preliminary estimates place the probable outturn at 73,200,000 bushels.

Consumption of Animal Fats, Greases, Etc.

	Jan.-Sept. 1934 lb.	Jan.-Sept. 1933 lb.
Tallow, inedible	527,495,483	435,586,531
Grease	190,653,606	155,004,538
Hydrogenated oils	355,324,316	322,126,933
Stearin, vegetable	37,057,280	26,435,792
Stearin, animal, ined	11,447,440	10,139,233
Fatty acids	108,599,316	83,149,361
Fatty acids, dist	25,001,672	21,409,040
Red oil	17,431,806	16,419,711
Stearic acid	7,499,728	7,297,660
Cottonseed foots	140,444,591	162,748,918
Cottonseed foots, dist	59,193,329	60,711,200
Other veg. oil foots	37,961,664	36,859,615
Other veg. oil foots distilled	116,856	52,570
Acidulated soap stock	34,965,618	43,014,490
Misc. soap stock	662,864	3,694,623
Totals	1,553,855,569	1,384,648,215

Production of Refined Vegetable Oils

	Jan.-Sept. 1934 lb.	Jan.-Sept. 1933 lb.
Cottonseed	758,062,955	802,434,889
Peanut	7,050,249	7,921,966
Coconut	237,061,192	210,104,865
Corn	91,235,523	91,895,373
Soya bean	4,163,614	9,515,991
Palm kernel	5,810,994	6,481,281
Totals	1,103,384,527	1,128,354,365

Consumption of Fish Oils

	Jan.-Sept. 1934 lb.	Jan.-Sept. 1933 lb.
Cod and cod-liver	8,174,591	6,965,126
Other fish	76,845,092	73,229,569
Marine animal	29,845,296	34,877,138
Totals	114,864,979	115,071,833

Factory Production, Consumption, and Stocks of Vegetable Oils

	Production		Consumption		Stocks 1934		Stocks 1933	
	Jan.-Sept., 1934 Lb.	Jan.-Sept., 1933 Lb.	Jan.-Sept., 1934 Lb.	Jan.-Sept., 1933 Lb.	Jan. 1 Lb.	Sept. 30 Lb.	Jan. 1 Lb.	Sept. 30 Lb.
Cottonseed, crude	745,248,783	878,455,029	826,005,479	880,254,492	170,430,329	74,034,028	143,835,031	119,580,165
Cottonseed, refined	758,062,955	802,434,889	887,668,103	735,961,110	769,101,513	450,011,959	730,492,495	622,798,885
Peanut, crude	7,133,396	10,866,227	7,177,565	10,370,189	1,527,267	1,463,624	1,305,387	1,068,046
Peanut, refined	7,050,249	7,921,966	3,306,951	5,734,689	1,687,404	654,722	2,109,183	1,878,704
Coconut, crude	236,038,952	252,495,744	469,366,351	423,118,658	182,827,051	174,924,416	120,928,496	132,529,537
Coconut, refined	237,061,192	210,104,865	217,711,927	223,400,134	15,562,155	37,381,003	14,227,342	16,399,887
Corn, crude	88,224,782	93,633,909	108,397,499	102,906,754	23,394,115	17,733,166	9,502,677	15,626,641
Corn, refined	91,235,523	91,895,373	29,924,398	19,877,202	12,044,000	9,556,618	12,431,224	10,985,122
Soya bean, crude	18,586,365	18,622,956	8,749,632	20,946,461	10,806,705	10,749,221	12,633,199	8,120,014
Soya bean, refined	4,163,614	9,515,991	6,605,025	6,962,932	2,563,999	3,872,208	3,739,006	2,608,727
Olive, edible	801,984	1,983,030	1,864,499	1,549,750	6,868,766	2,140,239	4,631,185	6,709,800
Olive, inedible	2,775	10,312	6,608,998	7,979,295	3,005,539	2,460,749	1,453,489	3,041,845
Olive, foots	....	....	24,313,958	26,863,489	10,858,223	19,620,822	13,504,643	11,248,373
Palm kernel, crude	....	....	15,312,510	13,267,950	11,413,281	6,755,466	6,422,736	4,696,492
Palm kernel, refined	5,810,994	6,481,281	5,190,545	5,842,726	577,155	950,488	781,980	860,705
Rapeseed	....	....	7,027,067	5,724,060	3,586,224	5,452,594	2,451,763	1,900,401
Linseed	280,515,403	272,042,244	203,118,968	186,820,170	157,735,565	109,367,402	121,775,377	99,631,578
China wood	....	....	80,888,821	69,292,649	41,750,367	24,164,769	30,914,786	34,402,374
Castor	31,833,598	33,677,876	15,443,326	15,100,931	14,381,125	12,285,985	12,304,864	12,684,432
Palm	....	....	155,538,701	180,534,647	105,794,413	75,833,807	80,333,910	92,196,139
Sesame	6,663,527	9,096,614	7,114,503	12,461,568	3,877,961	1,425,128	3,052,365	3,318,058
Sunflower	....	....	11,287,696	9,741,358	....	514,046	3,186,840	11,281,125
Perilla	....	....	12,338,582	11,708,208	2,690,459	7,988,936	6,143,786	5,592,607
All other	4,376,014	8,957,533	1,082,126	1,845,550	10,421,256	1,632,698	1,589,278	445,885
Totals	2,524,810,106	2,708,195,839	3,112,043,227	2,978,264,972	1,549,793,157	1,050,974,094	1,338,056,470	1,219,605,542

Washington Developments Affecting Chemical Industry

By PAUL WOOTON
Washington Correspondent of Chem. & Met.

PROCESS industries will be concerned, like all other divisions of manufacturing and merchandising business, in the broad legislative problems to which Congress is now addressing itself. Many radical proposals will be made, and some few may be enacted. However, especially with respect to general legislation, it is important that chemical engineering executives be not unduly disturbed by the extravagant proposals that often are mere opening salvos of serious legislative controversy.

The President's initial messages to Congress afford a reasonable ground for business optimism, particularly in the determination sharply to distinguish between employment relief, which is accepted as a Federal problem, and mere doles, which the President wishes to eliminate from the national budget. At best this is an objective seriously sought for. It is not a goal which can be reached this year. Congress is much too determined to use Federal money, rather than state and local funds, for many activities; and at least to this extent the President will not have his way, despite tremendous popularity and unprecedented influence.

For chemical industry the legislative prospect is really brighter than for most others. Labor rates in the industry are already so high and so stable that change in NRA, whatever it may be, can little affect our industries. Furthermore, with respect to chemicals there are no price problems in the main code and very few chemical process industries will suffer, even if the avowed Administration effort succeeds in eliminating opportunity for price control by code. And, most fortunate of all, is the employment situation which NRA characterizes as exceptionally good in the case of chemical manufacture.

Even though unemployment insurance be enacted, as seems likely, the chemical industries will find this burden as light as any, and may indeed be the soonest relieved of accumulation of reserves. At present forecasting is dangerous, but it looks as though money to meet unemployment insurance needs will come by a direct percentage burden on payrolls, perhaps 3 per cent. This may advance prices correspondingly, but with less serious consequence for chemical industry than for others.

Possibly the two most serious Washington problems of peculiar chemical interest are those which attach to the munitions-control and munitions-profit inquiry and those which center in the question of government competition, as through TVA. Certainly the chemical industry has been besmirched by the Nye committee activity; but the popular impression in Washington seems to be that the industry did not deserve this, and that no harmful legislation is likely to follow. With respect to government competition in chemical manufacture, TVA is for the moment a law unto itself. It is doubtful whether Congress will find time to do much, if anything, about this question during the current session. Chemical executives will, therefore, have to look to presidential action or to the conversion of TVA directors if complete peace of mind for the industry is to be established in this regard.

Renewed efforts toward new food and drug legislation stand among the items of principal interest. Senator Copeland has been revising his bill of last session in consultation with officials of the Food & Drug Administration and with the assistance of several experts, including Ole Salthe, formerly head of the Food & Drug Division of the New York City Department of Health when the Senator was health commissioner.

Officials of the Department of Agriculture continue to take the position that deficiencies in the law require strengthened authority. They express the hope that Senator Copeland's measure will be sufficiently in line with their views to preclude the need for introducing an alternate bill. It is anticipated that the measure will be considerably less drastic than the Tugwell bill last year.

The trend of labor legislation will be of interest to the industry with a drive for a 30-hour week law coming to the fore. Senator Black and Representative Connery will again introduce proposals to this end with strong vocal support by organized labor. It is not yet clear, however, whether labor considers this merely as a trading point to be abandoned in favor of some other measure such as the strengthening of Section 7A.

The 30-hour week would be directly felt by chemical firms with continuous operations where additional men obviously would be needed under shorter hours. The full increase in personnel may be offset to some degree by adjusting non-continuous schedules. In any event, both the direct effect in terms of added costs and the indirect economic consequences would bear heavily upon chemical producers who thus far have adjusted without difficulty to the milder, voluntary methods of NRA. Having no price fixing arrangement or other complications under the main chemical code, relations between the chemical industry and NRA have gone smoothly over the past year. No major readjustments in chemical codes are foreseen prior to the passage of a new NRA act.

Other labor measures such as the old-age pensions and unemployment reserve plans will be much discussed but the likelihood of their enactment, even in a mild form, is uncertain at this early stage. The shaping of restrictive legislation based upon the munitions investigation together with steps toward removing the profits from future wars likewise are not yet in tangible form.

Recommendations for centralized planning with regard to treatment works to remove stream pollution caused by industrial, mine, and sewage wastes were included in the report of the Mississippi River Committee of PWA. The strengthening of State services, interstate agreements, and the gathering of information by the U. S. Public Health Service as to conditions and remedies were advocated in the report.

TVA is producing phosphoric acid at Muscle Shoals thus far on a purely experimental scale with the real test of its ability to compete with private producers yet to come. Design and construction, with trial runs, have been carried on with two new types of electric furnaces and a new type blast furnace for producing elementary phosphorus; and two phosphoric acid plants. Aside from stating that no real trouble has been encountered in the processes, TVA has made no official announcements as to the results. TVA has leased 15,000 acres of phosphate ore areas in middle Tennessee bringing into production some areas hitherto considered unworkable. Mining operations are carried out in such a way that the land may later be restored to crop production. Agricultural experiment stations in the Valley are cooperating in tests seeking to adapt the product to local farm practice. TVA is adhering to its original objectives toward the development of new fertilizers, the use of new plant food resources, and the lessening of fertilizer costs to the farmer. The new plants are at Nitrate Plant No. 2, Muscle Shoals.

Prices for Chemicals Moved Upward During Last Year

WHILE there was very little change in the weighted index number for chemical prices from January to December last year, the average for the year was considerably higher than for 1933. Recessions from the level reached last January were more than overcome later in the year but at the close the trend if anything was downward and the current index is actually below that for January, 1934.

An examination of current prices reveals that the present year opened with lower prices quoted than at the beginning of last year for such important chemicals as potash salts, nitrate of soda, sulphate of ammonia, acetate of lime, acetic acid, and benzol. Spirits of turpentine, while higher than a year ago, hold that position by virtue of a recovery from much lower price levels which were current for the greater part of the last month.

Values for vegetable oils and animal fats not only rose sharply during the year but the highest point was reached in December and the trend was decidedly upward at the close of the year. In fact the weighted index number for January, 1935, was higher than that for any month of last year. Unless consumption declines further increases are expected.

Many reasons contributed to the price advances for oils and fats but the law of supply and demand was the most important factor. Production of cotton and cottonseed was curtailed by government decree and the heavy demand for cottonseed oil practically wiped out the carryover of oil and places the supply for the present year on a basis of dependence on the actual production for the year, although the high prices reached have encouraged importations. The important market factor is that the most important vegetable oil has been brought to a statistical position where a scarcity of stocks is not improbable.

CHEM. & MET. Weighted Index of CHEMICAL PRICES

Base = 100 for 1927

This month	**87.53**
Last month	88.01
January, 1934	87.86
January, 1933	84.54

Price changes during the month were in favor of lower prices. Spirits of turpentine while closing with a rising trend was low for the greater part of the period. Benzol and tartaric acid also were weak and lower in price.

To a greater or less degree the same situation exists in the market for animal fats. Marketing of hogs has gone along on a reduced scale as a result of a forced drop in production and the supply of lard has declined accordingly with a strengthening effect on all other animal fats.

The average price levels for chemicals and for animal fats as shown by the monthly index numbers of *Chem. & Met.* show the following fluctuations from 1924 through 1934:

	Chemicals	Vegetable Oils and Fats
1924	103.88	109.31
1925	104.41	117.12
1926	104.42	112.98
1927	100.00	100.00
1928	99.51	96.43
1929	100.10	97.55
1930	95.78	86.62
1931	87.61	61.90
1932	85.00	43.60
1933	85.58	51.48
1934	88.11	63.13

It is more difficult to establish the relative rate of production in the chemical industry. From data available it is evident that the industry as a whole was up as compared with 1933. In some cases declines in output were reported but generally such results came about because the chemicals in question were being replaced in certain operations by competing materials or because changes in process resulted in changes in materials used.

In the fertilizer field the call for animal ammoniates was lessened but a larger market was found for nitrate of soda, sulphate of ammonia, and potash salts. The pulp and paper trade and oil refiners cut down their requirements for caustic soda to a greater extent than their total activities would seem to warrant. These are typical examples which explain why some branches of the chemical industry were less active last year whereas the industry as a whole showed expansion.

The large consuming industries entered the new year in a favorable position and the outlook is encouraging for the movement of chemicals and other raw materials in the first quarter of the year.

Freight car loadings in the first quarter of 1935 are expected to be about six-tenths of 1 per cent above actual loadings in the same quarter in 1934, according to estimates compiled by the thirteen shippers' regional boards, made public recently.

On the basis of these estimates freight loadings of the twenty-nine principle commodities will be 4,528,744 cars for the first quarter of 1935, compared with 4,500,200 actual loadings for the same commodities in the corresponding period of last year.

Exports of chemicals and allied products from the United States were maintained at relatively high levels during the year according to the Bureau of Foreign and Domestic Commerce.

Exports of such products were valued at $113,000,000 during the first eleven months of the year, a value increase of 18 per cent over the corresponding period of 1933, when exports amounted to $95,500,000. Every major group on the list, except naval stores and sulphur, shared in the value gain and many groups showed substantial increases in tonnage.

Industrial chemicals led the list with export shipments valued at $19,588,000 during the first eleven months of the year, a gain of almost $5,000,000 over the corresponding period of 1933. Many important items of this group showed impressive volume gains.

Calcium chloride shipments increased 90 per cent to 58,000,000 lb. and sodium compounds increased 10 per cent to 439,000,000 lb. Potassium compounds, organic and inorganic acids, aluminum sulphate, and copper sulphate were among other items increasing both in quantity and value.

Industrial chemicals were followed in importance by naval stores, gums and resins, exports of which were valued at $13,315,000, a value almost identical with exports of these products during the 1933 period. In this group gum rosin exports totaled $5,962,000 in value showing little or no change from the first eleven months of 1933, but the volume declined from 914,000 to 714,000 barrels. Gum spirits of turpentine shipments were lower both in quantity and value, the quantity declining 25 per cent to 9,000,000 gal. and the value from $5,260,000 to $4,511,000.

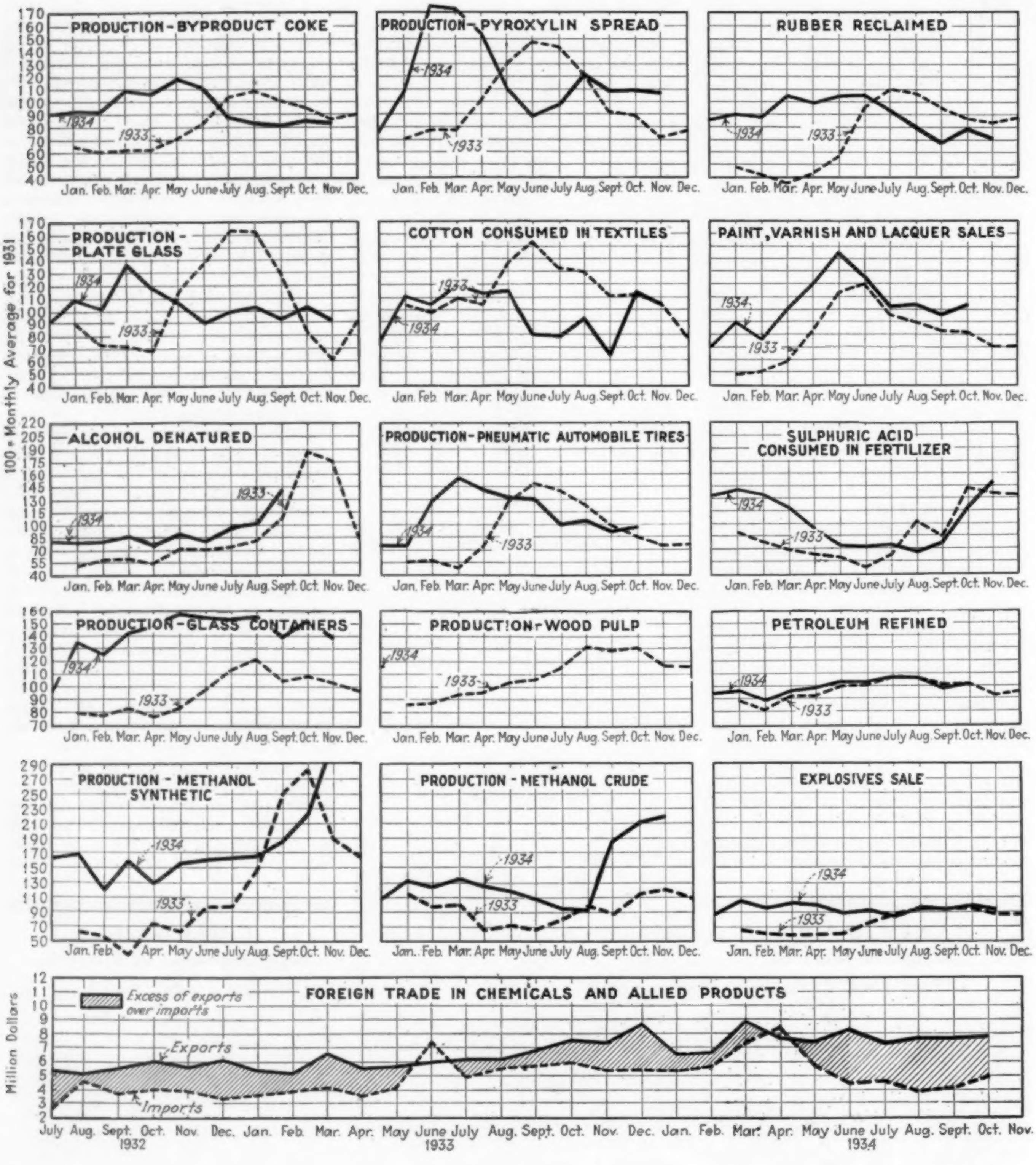
CHEM. & MET. Weighted Index of Prices for OILS AND FATS

Base = 100 for 1927

This month	**86.64**
Last month	83.32
January, 1934	51.38
January, 1933	42.46

Cottonseed oil rallies after every setback and continues to register new highs. Tallow also continues on an upward course and the weighted index number is again up sharply with coconut oil now joining the general trend.

TRENDS OF PRODUCTION AND CONSUMPTION



Current PRICES

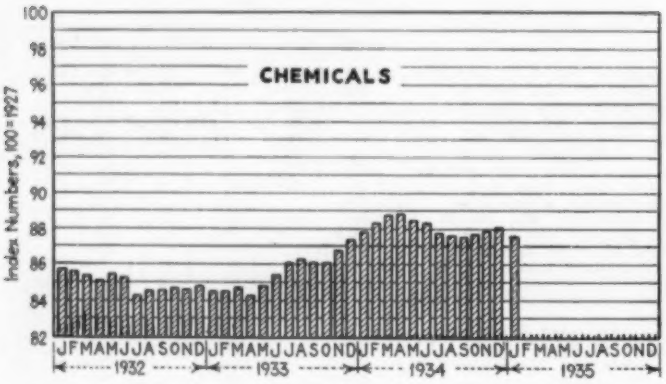
The following prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to Jan. 14.

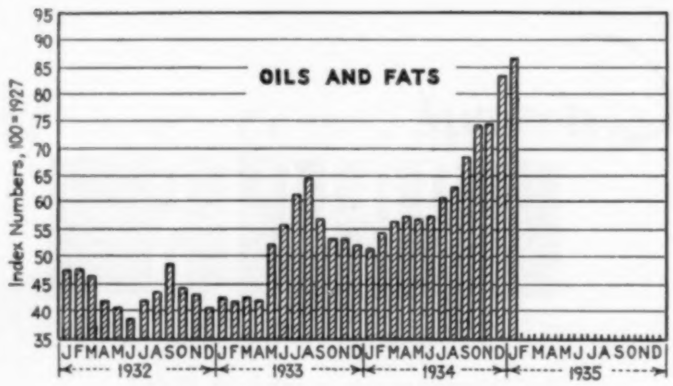
Industrial Chemicals

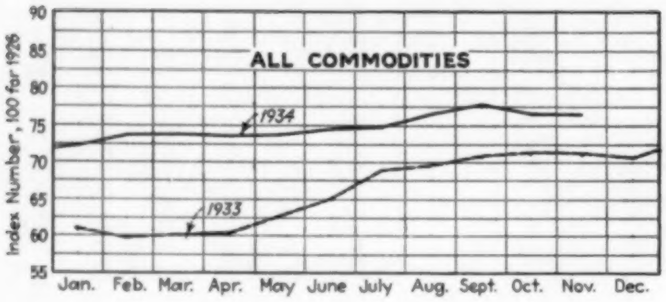
	Current Price	Last Month	Last Year
Acetone, drums, lb	$0.12 -$0.12½	$0.12 -$0.12½	$0.11 -$0.11½
Acid, acetic, 28%, bbl., cwt	2.40 - 2.65	2.40 - 2.65	2.90 - 3.15
Glacial 99%, drums	8.25 - 8.50	8.25 - 8.50	10.02 -10.27
U. S. P. reagent, c'bys	10.52 -10.77	10.52 -10.77	10.52 -10.77
Boric, bbl., lb	.04¾- .05	.04¾- .05	.04¾- .05
Citric, kegs, lb	.28 - .31	.28 - .31	.29 - .31
Formic, bbl., lb	.11 - .11½	.11 - .11½	.11 - .11½
Gallic, tech., bbl., lb	.60 - .65	.60 - .65	.60 - .65
Hydrofluoric 30% carb., lb	.07 - .07½	.07 - .07½	.07 - .07½
Latic, 44%, tech., light, bbl., lb	.12 - .12½	.12 - .12½	.11½- .12
22%, tech., light, bbl., lb	.06½- .07	.06½- .07	.05½- .06
Muriatic, 18° tanks, cwt	1.00 - 1.10	1.00 - 1.10	1.00 - 1.10
Nitric, 36°, carboys, lb	.05 - .05½	.05 - .05½	.05 - .05½
Oleum, tanks, wks., ton	18.50 -20.00	18.50 -......	18.50 -20.00
Oxalic, crystals, bbl., lb	.11¾- .12⅜	.11¾- .12⅜	.11¾- .12⅜
Phosphoric, tech., c'bys., lb	.09 - .10	.09 - .10	.09 - .10
Sulphuric, 60°, tanks, ton	11.00 -11.50	11.00 -11.50	11.00 -11.50
Sulphuric, 66°, tanks, ton	15.50 -......	15.50 -......	15.50 -......
Tannic, tech., bbl., lb	.23 - .35	.23 - .35	.23 - .35
Tartaric, powd., bbl., lb	.24 - .25	.25 - .26	.25½- .26
Tungstic, bbl, lb	1.40 - 1.50	1.40 - 1.50	1.40 - 1.50
Alcohol Amyl	......-......	......-......	......-......
From Pentane, tanks, lb	.143-......	.143-......	.15 -......
Alcohol, B tyl, tanks, lb	.12 -......	.12 -......	.095-......
Alcohol, Ethyl, 190 p'f., bbl., gal	4.15½-......	4.15½-......	2.53½-......
Denatured, 190 proof			
No. 1 special, dr., gal	.346-......	.346-......	.346-......
No. 5, 188 proof, dr., gal	.34 -......	.34 -......	.34 -......
Alum, ammonia, lump, bbl., lb	.03 - .04	.03 - .04	.03 - .04
Chrome, bbl., lb	.04½- .05	.04½- .05	.04½- .05
Potash, lump, bbl., lb	.03 - .04	.03 - .04	.03 - .04
Aluminum sulphate, com., bags cwt	1.35 - 1.50	1.35 - 1.50	1.35 - 1.50
Iron free, bg., cwt	1.90 - 2.00	1.90 - 2.00	1.90 - 2.00
Aqua ammonia, 26°, drums lb	.02½- .03	.02½- .03	.02½- .03
tanks, lb	.02½- .02¾	.02½- .02¾	.02½- .02¾
Ammonia, anhydrous, cyl., lb	.15½- .16	.15½- .16	.15½- .15¾
tanks, lb	.04½-......	.04½-......	.05 -......
Ammonium carbonate, powd tech., casks, lb	.08 - .12	.08 - .12	.08 - .12
Sulphate, wks., cwt	1.20 -......	1.20 -......	.125-......
Amylacetate tech., tanks, lb., gal	.142-......	.142-......	.145-......
Antimony Oxide, bbl., lb	.10½- .10¾	.10½- .10¾	.08 - .09
Arsenic, white, powd., bbl., lb	.03½- .04	.03½- .04	.04 - .04½
Red, powd., kegs, lb	.15¾- .16	.15¾- .16	.14 - .15
Barium carbonate, bbl., ton	56.50 -58.00	56.50 -58.00	56.50 -58.00
Chloride, bbl., ton	74.00 -75.00	74.00 -75.00	61.50 -63.50
Nitrate, cask, lb	.08½- .09	.08½- .09	.07½- .07½
Blanc fixe, dry, bbl., lb	.03½- .04	.03½- .04	.03½- .04
Bleaching powder, f.o.b., wks., drums, cwt	1.90 - 2.00	1.90 - 2.00	1.85 - 2.00
Borax, grain, bags, ton	40.00 -45.00	40.00 -45.00	40.00 -45.00
Bromine, cs., lb	.36 - .38	.36 - .38	.36 - .38
Calcium acetate, bags	2.00 -......	2.00 -......	3.00 -......
Arsenate, dr., lb	.06 - .07	.06 - .07	.07 - .08
Carbide drums, lb	.05 - .06	.05 - .06	.05 - .06
Chloride, fused, dr., wks., ton	17.50 -......	17.50 -......	17.50 -......
flake, dr., wks., ton	19.50 -......	19.50 -......	19.50 -......
Phosphate, bbl., lb	.07½- .08	.07½- .08	.07½- .08
Carbon bisulphide, drums, lb	.05½- .08½	.05½- .06	.05½- .06
Tetrachloride drums, lb	.05½- .08½	.05½- .06	.05½- .06
Chlorine, liquid, tanks, wks., lb	2.00 -......	2.00 -......	.0185-......
Cylinders	.05½- .06	.05½- .06	.05½- .06
Cobalt oxide, cans, lb	1.25 - 1.3	1.25 - 1.30	1.35 - 1.40
Copperas, bgs., f.o.b. wks., ton	14.00 -15.00	14.00 -15.00	14.00 -15.00
Copper carbonate, bbl., lb	.08½- .16	.08½- .16	.08½- .16
Cyanide, tech., bbl., lb	.37 - .38	.37 - .38	.39 - .40
Sulphate, bbl., cwt	3.85 - 4.00	3.85 - 4.00	3.75 - 4.00
Cream of tartar, bbl., lb	.17½- .18	.17½- .18	.18 - .19
Dietnylene glycol, dr., lb	.14 - .16	.14 - .16	.14 - .18
Epsom salt, dom., tech., bbl., cwt.	2.10 - 2.15	2.10 - 2.15	2.10 - 2.15
Imp., tech., bags, cwt	2.00 - 2.10	2.00 - 2.10	2.00 - 2.10
Ethyl acetate, drums, lb	.08½-......	.08½-......	.08½-......
Formaldehyde, 40%, bbl., lb	.06 - .07	.06 - .07	.06 - .07
Furfural, dr., contract, lb	.10 - .17½	.10 - .17½	.10 - .17½
Fusel oil, crude, drums, gal	.75 -......	.75 -......	.75 -......
Refined, dr., gal	1.25 - 1.30	1.25 - 1.30	1.25 - 1.30
Glaubers salt, bags, cwt	1.00 - 1.10	1.00 - 1.10	1.00 - 1.10
Glycerine, c.p., drums, extra, lb	.14 - .14½	.14 - .14½	.11 - .11½
Lead:			
White, basic carbonate, dry casks, lb	.06½-......	.06½-......	.06½-......
White, basic sulphate, sck., lb	.06 -......	.06 -......	.06 -......
Red, dry, sck., lb	.06 -......	.06½-......	.07½-......
Lead acetate, white crys., bbl., lb	.10½- .11	.10½- .11	.10½- .11
Lead arsenate, powd., bbl., lb	.09 - .10	.09 - .10	.10 - .11
Lime, chem., bulk, ton	8.50 -......	8.50 -......	8.50 -......
Litharge, pwd., csk, lb	.05¾-......	.05 -......	.06½-......
Lithophone, bags, lb	.04½- .05	.04½- .05	.04½- .05
Magnesium carb., tech., bags, lb	.06 - .06½	.06 - .06½	.05¾- .06½
Methanol, 95%, tanks, gal	.33 -......	.33 -......	.33 -......
97%, tanks, gal	.34 -......	.34 -......	.34 -......
Synthetic, tanks, gal	.35½-......	.35½-......	.35½-......
Nickel salt, double, bbl., lb	.12½- 13	.11½- .12	.12 - .13
Orange mineral, csk., lb	.09 -......	.09 -......	.10½-......
Phosphorus, red, cases, lb	.44 - .45	.44 - .45	.45 - .46
Yellow, cases, lb	.28 - .32	.28 - .32	.28 - .32
Potassium bichromate, casks, lb.	.07¾- .08½	.07¾- .08½	.07¾- .08½
Carbonate, 80-85%, calc. csk., lb	.07 - .07½	.07 - .07½	.06½- .07½
Chlorate, powd., lb	.09½- .10	.09½- .10	.09 - .09½
Hydroxide (c'stic potash) dr., lb.	.06¼- .06½	.06¼- .06½	.07½- .08
Muriate, 80% bgs., ton	22.00 -......	22.00 -......	37.15 -......
Nitrate, bbl., lb	.05½- .06	.05½- .06	.05½- .06
Permanganate, drums, lb	.18½- .19	.18½- .19	.18½- .19
Prussiate, yellow, casks, lb	.18 - .19	.18 - .19	.18 - .19
Sal ammoniac, white, casks, lb	.04½- .05	.04½- .05	.04½- .05
Salsoda, bbl., cwt	1.00 - 1.05	1.00 - 1.05	.90 - .95
Salt cake, bulk, ton	13.00 -15.00	13.00 -15.00	13.00 -15.00
Soda ash, light, 58%, bags, contract, cwt	1.23 -......	1.23 -......	1.20 -......
Dense, bags, cwt	1.25 -......	1.25 -......	1.22½-......
Soda, caustic, 76%, solid, drums, contract, cwt	2.60 - 3.00	2.60 - 3.00	2.50 - 2.70
Acetate, works, bbl., lb	.04¼- .05	.04¼- .05	.04¼- .05
Bicarbonate, bbl., cwt	1.85 - 2.00	1.85 - 2.00	1.85 - 2.00
Bichromate, casks, lb	.05¾- .06⅝	.05¾- .06⅝	.05¾- .06⅝
Bisulphate, bulk, ton	14.00 -16.00	14.00 -16.00	14.00 -16.00
Bisulphite, bbl., lb	.03 - .04	.03 - .04	.03½- .04
Chlorate, kegs, lb	.06¼- .06½	.06¼- .06½	.06¼- .06½
Chloride, tech., ton	12.00 -14.75	12.00 -14.75	12.00 -14.75
Cyanide, cases, dom., lb	.15½- .16	.15½- .16	.15½- .16
Fluoride, bbl., lb	.07½- .08	.07½- .08	.07 - .08
Hyposulphite, bbl., lb	2.40 - 2.50	2.40 - 2.50	2.40 - 2.50
Metasilicate, bbl., cwt	3.25 - 3.40	3.25 - 3.40	3.25 - 3.40
Nitrate, bags, cwt	1.24 -......	1.24 -......	1.295-......
Nitrite, casks, lb	.07¼- .08	.07¼- .08	.07½- .08
Phosphate, dibasic, bbl., lb	.022- .024	.022- 0.24	.02 - 0.23
Prussiate, yel. drums, lb	.11½- .12	.11½- .12	.11½- .02
Silicate (40° dr.) wks cwt	.80 - .85	.80 - .85	.80 - .85
Sulphide, fused, 60-62%, dr., lb.	.02¾- .03½	.02¾- .03	.02¾- .03
Sulphite, crys., bbl., lb	.02¼- .02½	.02¼ .02½	.03 - .03½
Sulphur, crude at mine, bulk, ton	18.00 -......	18.00 -......	18.00 -......
Chloride, dr., lb	.03½- .04	.03½- .04	.03½- .04
Dioxide, cyl., lb	.07 - .07½	.07 - .07½	.06½- .07
Flour, bag, cwt	1.60 - 3.00	1.60 - 3.00	1.55 - 3.00
Tin Oxide, bbl. lb	.56 -......	.56 -......	.57 -......
Crystals, bbl., lb	.38 -......	.38 -......	.38½-......
Zinc chloride, gran., bbl., lb	.05½- .06	.05½- .06	.05½- .06
Carbonate, bbl., lb	.09¾- .11	.09¾- .11	.09¾- .11
Cyanide, dr., lb	.38 - .42	.38 - .42	.38 - .42
Dust, bbl., lb	.057- .07	.057- .07	.07 - .07½
Zinc oxide, lead free, bag, lb	.06½-......	.06½-......	.05⅞-......
5% lead sulphate, bags, lb	.06¼-......	.06¼-......	.05⅜-......
Sulphate, bbl., cwt	2.75 - 3.00	2.75 - 3.00	3.00 - 3.25

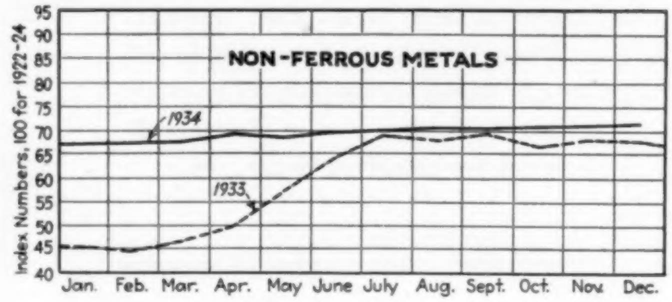
Oils and Fats

	Current Price	Last Month	Last Year
Castor oil, No. 3, bbl., lb	$0.09¾-$0.10	$0.09¾-$0.10	$0.09¾-$0.10
Chinawood oil, bbl., lb	.092-......	.09 -......	.08 -......
Coconut oil, Ceylon, tanks, N. Y. lb	.04⅜-......	.03⅜-......	.02¾-......
Corn oil crude, tanks, (f.o.b. mill), lb	.09¾-......	.09½-......	.03¼-......
Cottonseed oil, crude (f.o.b. mill), tanks, lb.	.09½-......	.09 -......	.03⅜-......
Linseed oil, raw car lots, bbl., lb.	.089-......	.087-......	.093-......
Palm, casks, lb	.03¾-......	.04½-......	.03⅜-......
Palm Kernel, bbl., lb	.04 -......	.03½-......	.04 -......
Peanut oil, crude, tanks (mill), lb.	.09¾-......	.09¾-......	.03½-......
Rapeseed oil, refined, bbl., gal	.41 - .42	.40 - .41	.42 - .43
Soya bean, tank, lb	.07⅜-......	.07½-......	.06 -......
Sulphur (olive foots), bbl., lb	.07¾-......	.07¼-......	.06½-......
Cod, Newfoundland, bbl., gal	.36 -......	.38 -......	.34 -
Menhaden, light pressed, bbl., lb;	.055-......	.046-......	.053-......
Crude, tanks (f.o.b. factory), gal.	.25 -......	.20 -......	.15 -......
Grease, yellow, loose, lb	.05⅜-......	.04½-......	.02½-......
Oleo stearine, lb	.09½-......	.08½-......	.05 -......
Red oil, distilled, d.p. bbl., lb	.07⅜-......	.07 -......	.06⅜-......
Tallow, extra, loose, lb	.05¾-......	.05⅜-......	.03 -......









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-naphthol, crude, bbl., lb..	$0.60 -$0.65	$0.60 -$0.65	$0.60 -$0.62
Refined, bbl., lb.	.80 - .85	.80 - .85	.80 - .85
Alpha-naphthylamine, bbl., lb..	.32 - .34	.32 - .34	.32 - .34
Aniline oil, drums, extra, lb.	.14½- .15	.14½- .15	.14½- .15
Aniline salts, bbl., lb.	.24 - .25	.24 - .25	.24 - .52
Benzaldehyde, U.S.P., dr., lb.	1.10 - 1.25	1.10 - 1.25	1.10 - 1.25
Benzidine base, bbl., lb.	.65 - .67	.65 - .67	.65 - .67
Benzoic acid, U.S.P., kgs, lb.	.48 - .52	.48 - .52	.48 - .52
Benzyl chloride, tech., dr., lb.	.30 - .35	.30 - .35	.30 - .35
Benzol, 90%. tanks, works, gal..	.15 - .16	.19 - .20	.20½- .21
Beta-naphthol, tech., drums, lb..	.22 - .24	.22 - .24	.22 - .24
Cresol, U. S. P., dr., lb.	.11 - .11½	.11 - .11½	.11- .11½
Cresylic acid, 97%, dr., wks., gal.	.50 - .51	.50 - .51	.50 - .51
Diethylaniline, dr., lb.	.55 - .58	.55 - .58	.55 - .58
Dinitrophenol, bbl., lb.	.29 - .30	.29 - .30	.29 - .30
Dinitrotoluen, bbl. lb.	.16 - .17	.16 - .17	.16 - .17
Dip oil 25% dr., gal.	.23 - .25	.23 - .25	.23 - .25
Diphenylamine, bbl., lb.	.38 - .40	.38 - .40	.38 - .40
H-acid, bbl., lb.	.65 - .70	.65 - .70	.65 - .70
Naphthalene, flake, bbl., lb.	.05½- .06½	.05½- .06½	.04½- .05
Nitrobenzene, dr., lb.	.08½- .09	.08½- .09	.08½- .10
Para-nitraniline, bbl., lb.	.51 - .55	.51 - .55	.51 - .55
Phenol, U.S.P., drums, lb.	.14½- .15	.14½- .15	.14½- .15
Picric acid, bbl., lb.	.30 - .40	.30 - .40	.30 - .40
Pyridine, dr., gal.	1.10 - 1.15	1.10 - 1.15	.90 - .95
Resorcinal, tech., kegs, lb.	.65 - .70	.65 - .70	.65 - .70
Salicylic acid, tech., bbl., lb.	.40 - .42	.40 - .42	.40 - .42
Solvent naphtha, w.w., tanks, gal.	.26 -.......	.26 -.......	.26 -.......
Tolidine, bbl., lb.	.88 - .90	.88 - .90	.88 - .90
Toluene, tanks, works, gal.	.30 -.......	.30 -.......	.30 -.......
Xylene, com., tanks, gal.	.26 -.......	.26 -.......	.26 -.......

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grd., white, bbl., ton...	$22.00-$25.00	$22.00-$25.00	$22.00-$25.00
Casein, tech., bbl., lb.	.09½- .10	.09½- .10	.12½- .13
China clay, dom., f.o.b mine, ton	8.00 -20.00	8.00 -20.00	8.00 -20.00
Dry colors:			
Carbon gas, black (wks.), lb...	.04 - .20	.04 - .20	.04 - .20
Prussian blue. bbl., lb.	.35½- .37	.35½- .37	.35 - .36
Ultramine blue, bbl., lb.	.06 - .32	.06 - .32	.06 - .32
Chrome green, bbl., lb.	.26 - .27	.26 - .27	.27 - .30
Carmine red, tins, lb.	4.00 - 4.40	4.00 - 4.40	3.65 - 3.75
Para toner, lb.	.80 - .85	.80 - .85	.75 - .80
Vermilion, English, bbl., lb.	1.56 - 1.58	1.56 - 1.58	1.35 - 1.40
Chrome yellow, C. P., bbl., lb.	.15 - .16	.15 - .15½	.15 - .15½
Feldspar, No. 1 (f.o.b. N.C.), ton	6.50 - 7.50	6.50 - 7.50	6.50 - 7.50
Graphite, Ceylon, lump, bbl., lb.	.07 - .08½	.07 - .08½	.07 - .08½
Gum copal Congo, bags, lb.	.09 - .10	.09 - .10	.06 - .08
Manila, bags, lb.	.09 - .10	.09 - .10	.16 - .17
Damar, Batavia, cases, lb.	.15½- .16	.15½- .16	.16 - .16½
Kauri No. 1 cases, lb.	.20 - .25	.20 - .25	.45 - .48
Kieselguhr (f.o.b. N.Y.), ton...	50.00 -55.00	50.00 -55.00	50.00 -55.00
Magnesite, calc, ton.	50.00 -.......	50.00 -.......	40.00 -.......
Pumice stone, lump, bbl., lb.	.05 - .07	.05 - .08	.05 - .07
Imported, casks, lb.	.03 - .40	.03 - .40	.03 - .35
Rosin, H., bbl.	5.85 -.......	5.75 -.......	5.35 -.......
Turpentine, gal.	.56 -.......	.53 -.......	.51 -.......
Shellac, orange, fine, bags, lb.	.35 -.......	.35 -.......	.26 - .27
Bleached, bonedry, bags, lb...	.24 - .30	.30 - .31	.29 - .31
T. N. bags, lb.	.19 - .23	.23 - .24	.21 - .22
Soapstone (f.o.b. Vt.), bags, ton	10.00 -12.00	10.00 -12.00	10.00 -12.00
Talc, 200 mesh (f.o.b. Vt.), ton..	8.00 - 8.50	8.00 - 8.50	8.00 - 8.50
300 mesh (f.o.b Ga.), ton.	7.50 -10.00	7.50 -10.00	7.50 -11.00
225 mesh (f.o.b. N. Y.), ton..	13.75 -....	13.75 -.....	13.75 -.....

INDUSTRIAL NOTES

WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J., has established a Pacific Coast regional headquarters at 510 West 6th Street, Los Angeles. C. E. Wilson, vice-president of the corporation, is in charge of the new headquarters.

THE PITTSBURGH EQUITABLE METER CO., Pittsburgh, Pa., announces the opening of a new district office at 67 McCall Street, Memphis, Tenn. Z. A. Stanfield has been appointed manager of this new territory.

READING IRON CO., Philadelphia, has appointed C. T. Ressler as specification engineer of the sales division at 401 No. Broad Street, Philadelphia. R. I. Fretz, formerly sales representative at Columbus, Ohio, has been made manager of eastern railroad and marine sales.

WILSON & BENNETT MFG. CO., Chicago, has advanced Harry F. LePan to the position of sales manager of its Western division with headquarters in the main office at Chicago.

INTERNATIONAL FILTER CO., Chicago, has appointed William M. Gross district sales manager in Ohio and eastern Michigan with headquarters at The Westlake, Cleveland.

THE BROWN INSTRUMENT CO., Philadelphia, has been consolidated with Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The Brown company will function as a separate concern of which Richard P. Brown will continue to act as president.

BABCOCK & WILCOX CO., New York, has appointed E. R. Jefferson, 332 So. Warren Street, Syracuse, N. Y., as agent in the central section of New York.

CANTON CULVERT CO., Canton, Ohio, subsidiary of Republic Steel Corp., has appointed Paul W. Gregory as general manager to succeed F. A. Kelly who was recently made president of the Toncan Culvert Mfrs. Association, Youngstown, Ohio.

GENERAL REFRACTORIES CO., Philadelphia, has appointed Collinwood Shale Brick & Supply Co., Cleveland, as dealer-agents.

AMERICAN MACHINE AND METALS, INC., New York, has acquired the DeBothezat Corp., makers of fans, blowers and other ventilating equipment. A. Ralph Stephan has been appointed vice-president and general manager of the DeBothezat Corp., general offices of which are now at 100 Sixth Ave., New York.

AMERICAN CYANAMID & CHEMICAL CORP., New York, has appointed Arthur J. Campbell assistant general sales manager of the corporation. Mr. Campbell also continues his duties as general manager of the structural gypsum division.

The Lindsay Light Co., Chicago, has changed its name to the Lindsay Light & Chemical Co.

New CONSTRUCTION

Where Plants Are Being Built in Process Industries

	—Current Projects—		—Cumulative 1934—	
	Proposed Work and Bids	Contracts Awarded	Proposed Work and Bids	Contracts Awarded
New England	$28,000	$10,000	$1,323,000	$1,538,000
Middle Atlantic	393,000	179,000	5,360,000	4,759,000
South	265,000	60,000	13,420,000	8,581,000
Middle West	470,000	218,000	9,729,000	3,058,000
West of Mississippi	28,000	....	16,266,000	1,262,000
Far West	328,000	28,000	4,559,000	2,724,000
Canada	1,586,000	30,000	5,165,000	1,959,000
Total	$3,098,000	$525,000	$55,822,000	$23,881,000

PROPOSED WORK BIDS ASKED

Asbestos Plant — Quebec Asbestos Corporation, Lennoxville, Que., Can., plans the construction of a plant here. Estimated cost $100,000.

Chemical Plant—Avite Products, Inc., Manchester, N. H., has acquired the former Prospect Mill of the American Woolen Co. at Lawrence, Mass., and will convert same into a chemical plant. Estimated cost with equipment $28,000.

Distillery—R. Cummins & Co., Battle Creek, Mich., is having plans prepared by L. Rossetti, 606 Marquette Bldg., Detroit, Mich., for the construction of an addition to its distillery to increase capacity by about 5,000 gal. daily. Estimated cost $50,000.

Distillery — Germantown Distilling Co., c/o Walker & Norwick, Archts., American Bldg., Dayton, O., plans to alter its distillery and power house at Germantown, O. C. J. Kiefer, Schmidt Bldg., Cincinnati, Engr. Estimated cost $40,000.

Distillery—Koiner Distilling Co., J. L. Koiner in charge, Koiner Mills (near Richmond), Va., plans the construction of a distillery on Hermitage Rd. Estimated cost $30,000.

Distillery—Old Dixie Distilling Co., c/o C. M. Mahaley, Falling Creek, Va., plans to construct a distillery. Estimated cost $35,000.

Distillery — Thomas Ward Distilling Co., Finksburg, Md., plans to construct an addition to its distillery. Estimated cost $40,000.

Distillery—Wigon Winery, Lodi, Calif., plans the construction of a distillery. Estimated cost including equipment $28,000.

Drug Factory—Anglo-Canadian Drugs, Ltd., Oshawa, Ont., Can., plans to construct a factory here. Estimated cost $50,000.

Glass Factory—Pittsburgh Plate Glass Co., Barberton, O., plans to construct an addition to its factory. Estimated cost $40,000.

Grease and Oil Plant—Southwest Grease & Oil Co., 225 North Waterman St., Wichita, Kan., plans to construct an addition to its plant. Estimated cost including equipment $28,000.

Gummed Products Factory—Gummed Products Co., Troy, Ohio, plans to construct a 1 story addition to its factory. John H. Deekman, Times Star Bldg., Cincinnati, O., Archt. Estimated cost $100,000.

Kiln—American Lime & Stone Co., Bellefonte, Pa., contemplates the construction of a new rotary kiln. Estimated cost $100,000.

Laboratory, Science Building, etc.—University of Arizona, Tucson, Ariz., plans the construction of a laboratory, science building and greenhouses. Roy Place, 11 East Pennington St., Tucson, Archt. P.W.A. project. Estimated cost $300,000.

Oil Refinery—Consumers Refineries Co-Operative Assn., Regina, Sask., Can., plans the construction of a refinery here. Estimated cost $28,000.

Oil Refinery — Mutual Petroleum Co. of Canada, Ltd., 4680 Iberville St., Montreal, Que., Can., plans the construction of an oil refinery at Pointe aux Trembles in the spring. Estimated cost $300,000.

Refinery — Naph-Sol Refining Co., W. E. Anderson, Mgr., Muskegon, Mich., is having plans prepared for a 25,000 gal. unit for cracking crude oil for the production of anti-knock gasoline. Estimated cost $200,000.

Refinery—St. Lawrence Oil, Ltd., Pointe Aux Trembles, Que., Can., plans to construct a refinery here and 15 gasoline stations at various locations on Montreal Island. Estimated cost $750,000.

Absorption Plant—Royalite Oil Co., Ltd., Calgary, Alta., Can., plans to construct an absorption plant at Turner Valley, Alta., Can. Estimated cost $300,000.

Insulating Board Factory — Johns-Manville Corp., 22 East 40th St., New York, N. Y., has leased the plant of the Oswego Board Corp., Oswego, N. Y., and will equip same for the manufacture of insulating boards and for distribution of the company's products. Estimated cost including equipment $28,000.

Rayon Mill—Burlington Mills, Greensboro, N. C., have leased the mills formerly occupied by the Gloria Textile Mills, at Johnson City, Tenn., from the Johnson City Industrial Corp., and will alter and install new machinery for rayon weaving. Estimated cost including equipment $200,000.

Factory—Dundas Clay Products, Ltd., Oswald D. Peat, Dundas, Ont., Can., plans the construction of a factory. Estimated cost including equipment $30,000.

Factory—I. B. Kleinert Rubber Co., 4th Ave. and 127th St., College Point, N. Y., plans to repair its factory recently damaged by fire. Estimated cost including equipment $30,000.

Refractories Plant—General Refractory Products, Ltd., Smokey Falls, Ont., Can., plans to develop fire clay, silica, feldspar and refractory deposits here.

Wax Factory—E. J. Bromound Co., Elmsford, N. Y., manufacturer of wax, contemplates the construction of a brick and concrete factory. Estimated cost $20,000.

Warehouses—A. Overholt & Son, distillers, Bradford, Pa., will soon receive bids for the construction of two warehouses. Estimated cost $175,000.

Warehouse—Trenton Valley Distilleries Corp., Trenton, Mich., is having plans prepared by George F. Diehl, Archt., 120 Madison Ave., Detroit, Mich., for the construction of a 4 story, 75x212 ft. rack warehouse with four galleries to have a capacity of 12,000 bbl. Estimated cost $40,000.

Tanks — Merrimac Chemical Co., Chemical Lane, Everett, Mass., plans the construction of nine steel tanks near Revere Beach Parkway.

CONTRACTS AWARDED

Chemical Factory—Champion Chemical Co., Springfield, O., manufacturer of mortician's supplies, awarded contract for 2 story, 112x306 ft. factory, to Green & Sawyer, Lima, O. Estimated cost $65,000.

Chemical Plant—Naugatuck Chemical Co., Elm St., Naugatuck, Conn., awarded contract 1 story, 20x110 ft. chemical plant, to W. J. Megin, Inc., 1 Elm St., Naugatuck. Estimated cost $10,000.

Distillery — J. E. Seagram, Lawrenceburg, Ind., awarded contract for 600 tons steel for new plant to Pollak Steel Co., 820 Temple Bar Bldg., Cincinnati, O., $47,500.

Factory — Hughes Mitchell Processes, Inc., 1461 Griffith Ave., Los Angeles, Calif., awarded contract for factory at 20201 Normandie Ave., San Pedro, Calif., to Consolidated Steel Corp., Eastern Ave., Los Angeles. Estimated cost $28,000.

Factory—Sutherland Paper Co., Pitcher and Paterson Sts., Kalamazoo, Mich., awarded contract brick and steel factory for the manufacture of paper cartons, to O. F. Miller Co., Kalamazoo. Estimated cost $60,000.

Glass Factory—Pittsburgh Plate Glass Co., Clarksburg, W. Va., will build an addition to their factory here. Separate contracts have been awarded for the work. Estimated cost $30,000.

Warehouse—Baltimore Pure Rye Distilling Co., Dundalk, Baltimore, Md., awarded contract for warehouse No. 3 to Engineering Contracting Co., 504 St. Paul St., Baltimore. Estimated cost $100,000.

Warehouse—Buffalo Springs Distilling Co., Stamping Ground, Ky., awarded contract for 4 story warehouse, to G. H. Graham, Frankfort, Ky. Estimated cost $30,000.

Warehouse—Diamond Crystal Salt Co., St. Clair, Mich., awarded contract for 1 story, 75x90 ft. warehouse and 5 story, 30x120 ft. evaporator building, to O. W. Burke Co., Fisher Bldg., Detroit. Estimated cost $45,000.

Yeast Factory—Best Yeast Co. awarded contract yeast plant at Liverpool, N. S., to Thesingh & Moss, 75 West St., New York, N. Y. Address owner in care of contractor. Estimated cost $30,000.

Laboratory Equipment—Treasury Dept., at office of Supervising Architect, Washington, D. C., awarded contract for laboratory equipment for Department of Justice Building, to Centaur Construction Co., 210 East 40th St., New York, N. Y., $61,820.

Tanks—E. I. duPont de Nemours & Co., Wilmington, Del., awarded contract for water and chemical storage tanks at its plant at Edgemoor, Del., to Hammond Iron Works, Hammond, Ind.

Larger Production of Coal-Tar Products

According to the United States Tariff Commission there were 193 firms in 1933 which were engaged in the manufacture of dyes and other coal-tar chemicals. In that year production of coke-oven and coal-gas tar was reported at 363,298,586 gal., of which about 52 per cent was distilled by purchasers of tar and a small percentage by the producers of tar. In addition 30,154,122 gal. of water-gas tar and 1,043,931 gal. of oil-gas tar were distilled.

Production of intermediates by 59 firms was 370,753,749 lb., or 69.9 per cent more than was produced in 1932 and 38.6 per cent more than the average for 1925-30. Five hundred and thirty-four chemicals were reported under this classification in 1933 as compared with 407 in 1930. Increased production in 1933 as compared with 1930 is shown for dye intermediates, such as aniline oil, 1 amino-2-naphthol-4-sulphonic acid, gamma acid, H acid, J acid, metanilic acid, and sulphanilic acid. Intermediates for resins, such as phenol and phthalic anhydride, increased remarkably, whereas refined cresylic acid decreased. Other important intermediates showing increased production are dinitrochlorobenzene, refined naphthalene, and nitrobenzene.

The production of dyes by 46 firms was 100,952,778 lb., or 7 per cent more than the average for the period 1925-30, and 41.6 per cent more than the output in 1932. Sales totaled 98,238,398 lb., valued at $43,102,469, or 6.5 per cent more in volume, and 9 per cent more in value than the 1925-30 average, and exceeded 1932 by more than 33 per cent in quantity. Sales of unclassified dyes, included in the total, increased to 7,734,981 lb., valued at $7,794,740. No comparison with 1932 is made because of the incompleteness of data for unclassified dyes for that year.

The weighted average value per pound of dyes sold in 1933 was $0.439, as compared with $0.428 average for 1925-30, and $0.448 in 1932.

The commission also reported on activities in synthetic organic chemicals not of coal-tar origin with production in 1933 reaching an all-time peak, the total being 771,574,595 lb. and sales reaching a total of 542,679,454 lb. valued at $55,604,615. Production increased 27 per cent and sales 24 per cent over the totals for 1930.

Comparison with 1930, the last year for which detailed statistics were collected, shows an increase of 129 per cent in sales of amyl acetate and sec. amyl acetate and a decline in unit sales value from 21c. per lb. to 10c. per lb. Sales of butyl acetate declined about 3 per cent in quantity and in unit value from 17c. per lb. to 9c. per lb. Sales of carbon tetrachloride increased about 5 per cent but the unit value declined from 6c. to 4.3c. per lb. Sales of ethyl acetate declined 48 per cent in volume and values dropped from 10c. to 6.9c. per lb. Production of formaldehyde increased 28 per cent and synthetic methanol 35 per cent over 1930.

Production and Sales of Dyes and Coal-Tar Chemicals

	Number of manufacturers	Production	Sales		
			Quantity	Value	Unit value
		Pounds	*Pounds*		
Intermediates	59	370,753,749	163,682,560	$23,704,672	$0.145
Finished products—total[1]	159	176,206,320	162,092,167	68,992,877	.426
Dyes:					
Classified	....	93,172,314	90,503,417	35,307,729	.390
Unclassified	....	7,780,464	7,734,981	7,794,740	1.01
Total	46	100,952,778	98,238,398	43,102,469	.439
Color lakes	36	7,584,313	7,574,481	5,224,377	.690
Photographic chemicals	10	825,887	688,976	678,564	.985
Medicinals	34	8,715,027	8,070,411	6,827,682	.846
Flavors	13	1,738,815	1,739,509	1,796,663	1.03
Perfume materials	20	1,420,501	1,225,929	687,141	.561
Synthetic resins[1]	33	41,628,485	31,657,653	7,238,560	.229
Miscellaneous[2]	27	13,340,514	12,896,810	3,437,421	.266

[1]Does not include coumarone and indene resins and resins derived from maleic acid.
[2]Includes benzoate of soda, benzoyl peroxide, stains and indicators, diazo salts, poisonous and tear gases, naphthol AS derivatives, rapid fast and rapidogene colors, research chemicals, tanning materials, textile assistants, and others.

Comparison of Production and Sales of Dyes and Coal-Tar Chemicals

	1925-30 average	1932	1933	Increase 1933 over 1932, per cent
Intermediates:				
Production, 1,000 lb	267,492	218,143	370,754	69.9
Sales, 1,000 lb	109,133	96,960	163,683	68.8
Sales value, $1,000	22,408	17,259	23,705	37.3
Finished coal-tar products[1]:				
Production, 1,000 lb	138,078	118,702	[2]176,206	48.4
Sales, 1,000 lb	133,964	114,980	[2]162,092	41.0
Sales value, $1,000	65,027	52,895	[2]68,993	30.4
Dyes:				
Production, 1,000 lb	94,003	71,269	100,953	41.6
Sales, 1,000 lb	92,207	73,591	98,238	33.5
Sales value, $1,000	39,428	32,944	43,102	30.8
Medicinals:				
Production, 1,000 lb	4,508	6,365	8,715	36.9
Sales, 1,000 lb	4,106	6,090	8,070	32.5
Sales value, $1,000	7,464	5,880	6,828	16.1
Flavors and perfume materials:				
Production, 1,000 lb	3,966	2,307	3,159	36.9
Sales, 1,000 lb	3,919	2,250	2,965	31.8
Sales value, $1,000	2,901	2,622	2,484	[3] 5.3
Coal-tar resins (1927-30):				
Production, 1,000 lb	24,442	29,039	[2]41,628	43.4
Sales, 1,000 lb	22,135	23,891	[2]31,658	32.5
Sales value, $1,000	7,756	5,001	[2]7,239	44.8

[1]Includes color lakes, photographic chemicals, and miscellaneous coal-tar products not shown separately.
[2]Does not include some resins.
[3]Decrease—due principally to low price of vanilla beans and other natural flavors.

Production of Coal-Tar Products

1925-1930 Average = 100